

IV. *The Terrestrial Isopoda of New Zealand.* By CHARLES CHILTON, M.A.,
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(Plates 11 16.)

THE first Terrestrial Isopoda described from New Zealand were those given by Dana* in 1853, in his account of the Crustacea collected by the United States Exploring Expedition; in it he described and figured in considerable detail 7 species (including one doubtful one), all of them from the northern part of New Zealand. In 1865 one or two species were added by Heller† in the report on the Crustacea of the Novara Expedition. In 1876 Mr. E. J. Miers‡ compiled a Catalogue of the New Zealand Crustacea, and in connection therewith described some new species that were in the collections of the British Museum; he added 5 species, and his catalogue contains altogether 12 species and one considered doubtful. During subsequent years a few species were added by Mr. G. M. Thomson§ and myself||, and all the species known were included in our "Critical List of the Crustacea Malacostraca of New Zealand."¶ In 1885 Budde-Lund** published his "Crustacea Isopoda Terrestria," and added two new species and mentioned most of those previously described, but as he was unable to examine specimens he could give no additional information on them, and was obliged to leave several of them under the heading of "uncertain species." Four other new species were described and figured by Filhol in 1885 in his "Mission de l'île Campbell," †† in which he also gave references to previously described species.

In the present paper I endeavour to give a complete list of all the New Zealand Terrestrial Isopoda at present known, with descriptions of the various species and figures where necessary. The material at my disposal consists chiefly of collections that I have accumulated since 1884. Besides specimens that I have collected myself, I have many from Mr. R. Helms, formerly of Greymouth, Mr. J. McMahon, of Kenepuru, Mr. W. W. Smith, of Ashburton, Mr. S. H. Drew, of Wanganui, Mr. H. Suter and Mr. R. M. Laing, of Christchurch, and Mr. L. Hames, of Takapuna. Mr. G. M. Thomson has very kindly placed in my hands the whole of his collection, including

* J. Dana: U. S. Exploring Expedition, Crustacea, vol. ii. pp. 713 *et seq* (1853).

† Cam. Heller: "Reise der Novara," Zool. Bd. 2, pp. 134-136 (1865).

‡ E. J. Miers: Annals & Mag. Nat. Hist. (ser. 4) xvii. pp. 225-227 (1876); and Catalogue New Zealand Crustacea, pp. 94-102 (1876).

§ G. M. Thomson: Trans. N. Z. Inst. xi. p. 232 & p. 249 (1879); and Annals & Mag. Nat. Hist. (ser. 6) xii. pp. 225-227 (1893).

|| C. Chilton: Trans. N. Z. Inst. xv. p. 73 & p. 149 (1883), & xviii. p. 159 (1886).

¶ Trans. N. Z. Inst. xviii. pp. 141-159 (1886).

** "Crustacea Isopoda Terrestria," Copenhagen (1885).

†† "Mission de l'île Campbell," Recueil Mem. Acad. Sci. (Venus) iii. part 2, pp. 439-446 (1885).

the type specimens of some species described by him. Through the kindness of Professor F. Jeffrey Bell and Mr. R. I. Pocock, I have been able to examine type specimens of Miers' species in British Museum, and Monsieur Adrien Dollfus has sent me species from Europe that have been most useful for comparison. To all these gentlemen I desire to record here my hearty thanks.

Some of the work involved in the preparation of this paper was done in the Natural History Department of the University of Edinburgh, where Professor Cossar Ewart kindly gave me the use of a table, but a large part has been done during vacations in the laboratory of the University College, Dundee, and I desire to record my thanks to Professor D'Arcy W. Thompson, C.B., for the facilities placed at my disposal, and for permission to make free use of the rich stores of Terrestrial Isopoda in the collections under his care, while to Dr. W. T. Calman I am greatly indebted for much kind assistance during the progress of the work.

I have, as far as possible, followed the classification and nomenclature adopted by Professor G. O. Sars in his fine work on the Crustacea of Norway, and have to thank him for sending me the parts bearing on the Isopoda. I have tried to give all the references specially dealing with the New Zealand species, but in the case of species and genera that are also known from elsewhere, I have only given one or two of the most important; for the benefit of workers in New Zealand, where books of reference are few, I have given diagnoses of all the genera, taking these in most cases from Sars' work, and have also given short notes on the characters of the families.

It will be seen that the Terrestrial Isopodan fauna of New Zealand is fairly rich and varied, all the families but one being represented. I am able to give 27 species, belonging to 13 genera, of which only 3 or 4 are "uncertain species"; for the sake of comparison it may be mentioned that in the last list of the Terrestrial Isopoda of the British Isles, as given by Canon Norman*, there are 20 species, belonging to 11 genera. Moreover, it is probable that the number of New Zealand species will hereafter be increased, especially when the North Island has been thoroughly searched, for at present the majority of my specimens are from the South Island, and only a few more or less haphazard collections have been made in the North Island. Of the outlying islands of New Zealand, I have only two species from Chatham Islands, and one from the Auckland Island. Three species are at present known from single specimens only, and two others have been found only in one locality and on a single occasion. In addition to the species given, specimens from ants' nests, probably belonging to *Platyarthrus*, were referred to by Mr. W. W. Smith, in a paper dealing with some New Zealand Ants, and were stated to have been sent to Europe with other collections from ants' nests. I have endeavoured to trace these specimens, but without success, and so far Mr. Smith has not been able to procure fresh specimens for me.

The Terrestrial Isopoda are well worthy of study from the point of view of the geographical distribution of animals, and the facts of their distribution will be of great value for testing the correctness of the views as to the origin of the fauna of particular

* Annals & Mag. Nat. Hist. ser. 7, iii. pp. 70-78.

countries and places, for they are strictly terrestrial animals, and as their young are hatched in the incubatory pouch of the female, it seems unlikely that they could cross even comparatively narrow tracts of ocean, except by rare accidents, while a continuous range of high mountains would also be a formidable barrier. In the *New Zealand Journal of Science*, vol. ii. (1884) p. 155, I have already called attention to the question, and have also pointed out that their distribution in any given land-area may be to some extent influenced by floods in the rivers carrying logs with the Isopods attached to great distances, and have given the following instance where this appears to have actually taken place.

The species *Armadillo regulosus* (= *Cubaris regulosus*, Miers) is common on logs and under the bark of trees in the bush, but I had not found it on the open Canterbury Plains except at one place, Eyreton, where I got numerous specimens under some logs that had been carted for firewood from the river Waimakariri, after having been washed down by the river for at least twenty miles, probably further, from places where the species was abundant. It seems likely that the Isopod had been washed down with the logs, for I found it only at that particular spot at Eyreton, and after the logs had all been used it was no longer seen in that district.

It would, therefore, be interesting if some facts could be given as to the distribution of our New Zealand species, especially of any that may be found in other countries. Unfortunately, however, so little is at present known of the Terrestrial Isopoda of Australia and other lands of the southern seas, that little can as yet be said with certainty.

Of the species, by far the greater part (18) are known only from New Zealand; two species, *Porcellio scaber*, Latr. and *Armadillidium vulgare*, Latr., are cosmopolitan, and have probably been introduced by artificial means; another species, *Philoscia pubescens*, Dana, appears to be identical with a species found at the Cape of Good Hope and at the Seychelles; *Aclæcia euchroa*, Dana, is found in Tasmania as well as in New Zealand; while *Ligia nova-zealandia*, Dana, and *Oniscus punctatus*, Thomson, are represented in Tasmania by closely allied species, and *Tylos neozelanicus* is probably equally closely related to *T. spinulosus*, Dana, from Tierra del Fuego. In the genus *Trichoniscus* it is rather difficult to make any comparison between the numerous species, but the genus is a very widely distributed one, and species are known from Tristan d'Acunha and Valparaiso*, and from the Straits of Magellan†. The genus *Armadillo* is represented in New Zealand by at least six species, the greater number of the species of the genus occur in the tropical countries, and Budde-Lund‡ has pointed out that about half of them are from the islands and shores of the Pacific.

Of the distribution and occurrence of the different species in New Zealand itself a little more can be said. Six species (i. e. *Ligia nova-zealandia*, *Tylos neozelanicus*, *Scyphax ornatus*, *Aclæcia euchroa*, *Aclæcia opihensis*, and *Scyphoniscus waitatensis*) are

* Dollfus: "Isopodes terrestres du 'Challenger,'" Société d'Études Scientifiques de Paris, xii^e Année (1890), pp. 5 & 6 (separate copy).

† Stebbing: Proc. Zool. Soc. London, 1900, Part iii. p. 566.

‡ Isopoda Terrestria, p. 16.

littoral, being found on or near the sea-beach, and probably *Scyphax* (?) *aucklandiæ* should also be added to this list. Of these, *Ligia novæ-zealandiæ* is found all round the New Zealand coast, and is very abundant under stones or sea-weed, especially on rocky portions of the shore; *Scyphax ornatus* and *Actæcia euchroa* are found on sandy beaches either on the surface or burying themselves a little in the sand about high water mark or a little lower; *Scyphax ornatus* is probably abundant on all such beaches in the North Island, but in the South Island has, so far, been recorded from Westport only; *Actæcia euchroa* is known from the south as well as the north, and is also found in Tasmania. The remaining littoral species have as yet been recorded each from one locality only.

Of the more strictly terrestrial forms, leaving out of account the two cosmopolitan species *Porcellio scaber* and *Armadillidium vulgare*, and also *Philoscia pubescens*, which is found at the Cape of Good Hope and elsewhere, we have *Oniscus punctatus*, found in all parts of New Zealand; *Armadillo ambitiosus* from all parts of the North Island, and from Kenepuru and Greymouth in the South Island, but not known further south; while, on the contrary, *Armadillo rugulosus* and the three species of *Trichoniscus* are widely distributed in the South Island, but as yet not recorded from the North, though in the case of *Trichoniscus* this is no doubt partly owing to their small size. Of the remaining species too little is known to justify any general remark.

It may perhaps be well to mention here a few of what seem to be the more important points brought out in this paper. I have been able to settle, in what I hope will be considered a satisfactory manner, uncertainties that have long existed with regard to several of Dana's descriptions, and in so doing to reduce to the rank of synonyms some species subsequently described (see *Ligia novæ-zealandiæ*, *Scyphax ornatus*, *Philoscia pubescens*, *Armadillo speciosus*): I establish a new family, *Scyphacidae*, corresponding mainly with Dana's subfamily *Scyphacinae*, which had been ignored by most subsequent writers, and show that the imperfect development of the seventh pair of legs, which Dana had considered a character of the genus *Scyphax*, is merely an immature character which in this instance is retained till a later period of life than usual, and settle the question as to the relationship of *Scyphax ornatus* to *Actæcia euchroa* by showing that the only connection between them is that both have the same habit of living on sandy beaches.

In the case of some of the commoner species, I have had numerous specimens from many localities, and have thus been able to make some observations as to the variations that may be met with in these species.

In most of the species there is to be found on the dactylus a specially long and peculiar seta which has characteristic forms in some, at any rate, of the genera. Schiödte figured this "dactylar seta" many years ago in *Tilanelthes* * *albus*, and Weber mentioned its presence in some species of *Trichoniscus* †, but I cannot find that any one has drawn special attention to it, though in some cases it is rather noticeable, and together with the form of the dactylus itself, may be of use in readily identifying

* Bidrag til den underjordiske Fauna (Copenhagen, 1849).

† "Anatomisches über Trichonisciden," Archiv für Mikroskop. Anatomie, Bd. xix. p. 582.

he genus. In *Ligia* the dactylar seta is unbranched and slightly clubbed at the end; in *Trichoniscus* it divides into two branches, each further subdividing into fine filaments; in *Scyphoniscus* it divides similarly, though differing a little in detail; in *Tylos* it is rather short, unbranched, and has the distal half thicker and stippled-looking; in *Aclaccia euchroa* it is somewhat similar; while in *Aclaccia (?) opihensis* it is larger and very distinct, and the stippled appearance of the distal portion looks under a high power as if it were caused by the distal portion, resembling a narrow circular brush with short hairs projecting all round it. It is sometimes lost in specially old and large specimens, but with this exception is always to be found in the genera mentioned; I cannot, however, find it at all in *Scypha*, *Oniscus*, *Philoscia*, *Armadillidium*, and *Armadillo*. Beyond the suggestion that it is a tactile organ, I can give no information as to its function. A seta, probably also of a sensory nature, is found similarly situated in *Asellus aquaticus* and some other Isopods, and also in many Amphipods, but in these it is less prominent, and does not take such varied forms.

In all the genera, and especially those hitherto imperfectly known, I have examined the mouth-organs in some detail; an accurate knowledge of these will, I think, in time help us on towards a natural classification of this group, for they seem to be much more constant than characters taken from the general shape of the body, from the uropoda, or even from the presence or absence of air-cavities in the pleopoda. It is true that we may get sudden variations in some of the mouth-parts, such as that I have described in the outer lobe of the first maxilla of *Scyphoniscus*, or by Dollfus in the inner lobe of the same maxilla in *Mesarmadillo*; but these, occurring as they do in groups in which the mouth-parts are otherwise very constant, are probably to be looked upon as sudden variations or "sports" that have comparatively little value from a classificatory point of view.

I give here a Table, based mainly on the mouth-parts, showing briefly what appear to be the more important characters of the various families:—

- A. Mandibles with well-developed molar tubercle; inner lobe of 1st maxilla with three plumose bristles.
 - I. Uropoda not concealed under pleon.
 - a. Antennæ with flagellum multiarticulate; eyes large; male organ double LIGIIDÆ.
 - b. Antennæ with flagellum not more than 6-jointed; eyes small; male organ single TRICHONISCIDÆ.
 - II. Uropoda concealed under pleon.
 - a. Segments of pleon separate TYLIDÆ.
 - b. First five segments of pleon coalesced HELLERIDÆ.
- B. Mandibles without distinct molar tubercle, its place being taken by a brush-like group of setæ; inner lobe of first maxilla with only two plumose bristles.
 - I. Maxillipedes with terminal joints of moderate size; lamellar longer than masticatory lobe SCYPHEIDÆ.
 - II. Maxillipedes with terminal joints small and almost rudimentary, hardly longer than masticatory lobe.
 - a. Uropoda more or less projecting; animals not rolling into perfect ball ONISCIDÆ.

- c. Uropoda not projecting beyond terminal segment; animals rolling into perfect ball ARMADILLIDÆ.

While this table does not profess to be any very near approach to a natural classification of the Terrestrial Isopoda, it is probable that the two large divisions A and B do represent distinct groups in which development has proceeded on similar lines, in each case leading from animals living on the sea-shore within reach of the waves and breathing only very moist air, to others of pure terrestrial habits capable of breathing ordinary dry air, *i. e.* the Helleridæ in the one case, and the Armadillidæ in the other. It is interesting to notice, too, how the protection afforded by the animal's power of rolling itself up into a ball has been acquired in different groups that are certainly of independent origin, *e. g.* in the Tyliidæ, Helleridæ, Armadillidæ, and to a less perfect degree in some of the Scyphacidæ (*e. g.* Actæcia), and perhaps also in some of the Oniscoidæ, and how similar is the general appearance of the body in each of these groups, though of course the detailed arrangements by which it is acquired vary. If we go beyond the Oniscoidea, we find a similar power of rolling into a ball and a somewhat similar external appearance in the Sphæromidæ and, among the Myriapoda, in the Glomeridæ.

A tabular arrangement of the Oniscoidea, based on much the same characters as I have used, was given many years ago by Ulianin *; his table, however, goes into greater detail and separates the genera, and unfortunately it is in the Russian language †.

For the benefit of those who may wish to identify their specimens without going to the trouble of dissecting out the mouth-parts, I give the following artificial key to the New Zealand genera, and a similar key to the species under each genus represented by more than one species:—

- A. Body convex; animal capable of rolling into a ball.
 - I. Flagellum of antenna 2-jointed.
 - 1. Outer branch of uropoda large and terminal *Armadillidium*.
 - 2. Outer branch of uropoda small, inserted on the inner side of the enlarged base. *Armadillo*.
 - II. Flagellum of antenna with more than two joints.
 - 1. Uropoda quite concealed beneath terminal segment *Tylos*.
 - 2. Uropoda extending beyond terminal segment and visible in dorsal view *Actæcia*.
- B. Body more or less flattened; animal not capable of rolling into a ball.
 - I. Flagellum of antennæ many-jointed *Lygia*.
 - II. Flagellum 2-jointed.
 - 1. Side-plates of metasome large, expanded *Porcellio*.
 - 2. Side-plates of metasome small, adpressed *Metoponorthus*.
 - III. Flagellum with three to six joints.
 - 1. Eyes large, crescent-shaped, of many ocelli *Scyphar*.
 - 2. Eyes small, not more than three ocelli.
 - a. Body with longitudinal ridges *Haplophthalmus*.

* 'Crustacea Turkestanica,' St. Petersburg & Moscow, 1875 (see Bûdde-Lund, *l. c.* p. 12).

† I have to thank Mr. H. A. Webster, Librarian, University of Edinburgh, for translating a portion of Ulianin's work for me.

- b.* Body without longitudinal ridges *Trichoniscus*.
- 3. Eyes of moderate size, more than three ocelli.
 - a.* Pleon with lateral expansions *Oniscus*.
 - b.* Pleon with lateral expansions.
 - i. Flagellum much shorter than last joint of peduncle *Scyphoniscus*.
 - ii. Flagellum about as long as last joint of peduncle *Philoscia*.

In the following list 27 species are mentioned, but of these there are 4 which I have not seen, and which must be considered as more or less uncertain, though one, *Armadillo spinosus*, Dana, is in all probability a good species and distinct from the others given, and I have therefore included it in the artificial key to the species. I have not been able to do this with the other three species.

List of Species.

ONISCOIDEA.

I. LIGIIDÆ.

- 1. *Ligia novæ-zealandiæ*, Dana.

II. TRICHONISCIDÆ.

- 2. *Trichoniscus phormianus*, sp. nov.
- 3. „ *otakensis*, sp. nov.
- 4. „ *Thomsoni*, Chilton.
- 5. *Haplophthalmus Helmsii*, sp. nov.

III. TYLIDÆ.

- 6. *Tylos neozelanicus*, sp. nov.

IV. SCYPHIACIDÆ.

- 7. *Scyphar ornatus*, Dana.
- 8. „ (?) *aucklandiæ*, G. M. Thomson.
- 9. *Scyphoniscus waitatensis*, nov. gen. et sp.
- 10. *Actæcia euchroa*, Dana.
- 11. „ *opihensis*, sp. nov.

V. ONISCIDÆ.

- 12. *Oniscus punctatus*, G. M. Thomson.
- 13. „ *kenepurensis*, sp. nov.
- 14. „ *Cookii*, Fillhol (*not seen*).
- 15. *Philoscia pubescens*, Dana.
- 16. „ *novæ-zealandiæ*, Fillhol (*not seen*).
- 17. *Porcellio scaber*, Latreille.
- 18. ? *Metoponorthus pruinosus*, Brandt.

VI. ARMADILLIDÆ.

- 19. *Armadillidium vulgare*, Latreille.
- 20. *Armadillo ambitiosus*, Budde-Lund.
- 21. „ *Danae*, Heller.
- 22. „ *speciosus*, Dana.
- 23. „ *rugulosus*, Miers.
- 24. „ *monolinus*, Dana (*not seen*).
- 25. „ *Hamiltoni*, sp. nov.
- 26. „ *Macmahoni*, sp. nov.
- 27. „ *spinosus*, Dana (*not seen*).

Family I. LIGIIDÆ.

In this family the antennæ have the flagellum multiarticulate, *i.e.* with more than six or seven joints, the mandible has a well-developed molar tubercle with triturating surface, the inner lobe of the first maxilla bears three plumose bristles, the terminal portion of the maxillipede is of moderate size and more or less distinctly divided into five joints, and the external male organ is double.

The family contains several genera, the best known being *Ligia*, *Ligidium*, and *Titanethes*. The genus *Geoligia*, Dollfus, appears to be very near to *Ligia*, but the only known species, *G. Simoni*, lives far away from the sea, while all the species of *Ligia* are found on the sea coast.

If *Styloniscus magellanicus*, Dana, belongs to *Trichoniscus* as Stebbing* thinks, it is evident that the distinction between the Ligiidæ and the Trichoniscidæ as regards the antennæ breaks down, for in that species the antenna may have the flagellum with as many as ten joints. Dollfus, when describing this species, had previously stated that *Styloniscus*, Dana, is very near to *Ligidium*, and differs from it only in the uropods, which want the long hairs characteristic of that genus †; in making this statement, however, he may have had in his mind also the species *Styloniscus gracilis*, Dana, in which the uropoda do resemble those of *Ligidium* as Stebbing has also pointed out, but it is doubtful whether this species is really congeneric with *S. magellanicus*.

In any case the differences between the Ligiidæ and the Trichoniscidæ are not great, and the existence of genera intermediate in characters is only what we may naturally expect.

Dana placed *Styloniscus* in his sub-family Scyphacina, but from Stebbing's description of the mouth-parts of *S. magellanicus* it is evident that that species at any rate cannot come under the family Scyphacidæ as I have defined it further on.

Genus 1. LIGIA, Fabricius, 1798.

Ligia, Bate & Westwood, British Sessile-Eyed Crustacea, ii. p. 442 (1868).

Ligia, Budde-Lund, Crustacea Isopoda Terrestria, p. 258 (1885).

Ligia, Sars, Crustacea of Norway, ii., Isopoda, p. 155 (1899).

The generic characters are given by Sars as follows:—

“Body regularly oval, or oblong oval, moderately convex above, with the metasome not abruptly contracted; last segment rather broad, with distinct epimeral plates. Eyes large and convex. Antennulæ very small, with the last joint rudimentary, nodiform. Antennæ rather strong and elongated. Mandibles with a ciliated lappet and numerous penicils behind the cutting part. Maxillipeds comparatively short and stout, with the terminal part rather expanded, epignath rounded. Legs gradually increasing in length posteriorly, dactylus distinctly bi-unguiculate. Opercular plate of pleopoda sub-branchial. Uropoda more or less elongated, basal part not produced inside, rami narrow, styliform, subequal, each with a single apical spine.”

This is the only genus of the family that is represented in New Zealand, and the single species, *L. novæ-zealandiæ*, described below, agrees well with the characters of the genus as just quoted from Sars. It differs, however, from the characters of the family in that the two hairy bristles on the inner side of the second maxilla are wanting, and the terminal part of the maxillipeds, though showing distinct evidence of five joints, has the three joints preceding the terminal one united together into one plate with the sutures only partially indicated. The external male organs are considerably different from those of the typical species *L. oceanica*. In all these points *L. australiensis*, Dana, from Australia, closely resembles *L. novæ-zealandiæ*, and as these peculiarities are probably shared by other species which like them are nevertheless true *Ligia*, it will be well to slightly modify the characters of the family as laid down by Sars in order that these species may be included.

* Proc. Zool. Soc. 1900, p. 566.

† Mission du Cap Horn, Crustacés, p. 72.

I. *LIGIA NOVI-ZEALANDIÆ*. (Pl. 11. fig. 1.)

Lygia novi-zealandiæ, Dana, U.S. Explor. Exped. xiv. Crust. part ii. p. 739, pl. xlix. fig. 2 (1853).

Ligia novæ-zealandiæ, Miers, Cat. Crust. of New Zealand, p. 103 (1876).

Ligia quadrata (Hutton, MS. Cat. N. Z. Crust.), G. M. Thomson, Trans. N. Z. Inst. xi. p. 232, pl. x A, figs. 4 & 4a (1879).

Ligia novæ-zealandiæ, Budde-Lund, Crustacea Isopoda Terrestria, p. 271 (1885).

Ligia quadrata, Budde-Lund, *l. c.* p. 271 (1885).

Ligia novæ-zealandiæ, Filhol, Mission de l'île Campbell, p. 445 (1885).

Ligia quadrata, Filhol, *l. c.* p. 445 (1885).

Ligia neo-zealanica, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 157 (1886).

Ligia quadrata, Thomson & Chilton, *l. c.* p. 157 (1886).

Specific description.—Body elongate oval, about twice as long as broad, rather convex; surface finely granular, sometimes with minute setæ, giving it a punctate appearance. Outer antennæ slender, minutely setose, two-thirds the length of the body; fifth joint of peduncle as long as the third and fourth combined, flagellum fully twice as long as the fifth joint with about twenty joints. Eyes large, subquadrate, distinctly angled towards the middle line, facets very numerous and of small size. Vertex with a transverse depression just posterior to the angle of the eyes, interrupted in the middle.

Posterior border of the first and second segments of the mesosome transverse, not produced backwards at the lateral angles; lateral angles of the remaining segments progressively more and more produced backward, those of the seventh segment reaching as far as the angle of the third segment of metasome. Side-plates ("epimera") large, distinctly marked off from the middle part of the segment by a longitudinal sulcus in the second, third, and fourth segments, the sulcus very indistinct in the remaining segments. Legs spinose, gradually increasing in length posteriorly, the first and second in the male having the carpus broadened, and the propodos and dactylus impinging against it to form a subchelate hand, the first being broader than the second; in the female all the legs simple; in each leg the dactylus has a secondary slender nail about half the length of the terminal nail; at the base of the terminal nail arises on the outer side a long seta slightly clubbed at the end and reaching as far as the end of the terminal nail.

Terminal segment of the metasome subquadrate, its lateral angles acute but not much produced, posterior margin regularly convex in the middle. Uropods with the peduncle subcylindrical, about half the length of metasome; the two rami of nearly equal length, the outer often rather the shorter and more slender, both tapering, minutely setose, and with one or two apical setæ.

Colour: yellowish, closely speckled with black, giving a greyish or slaty effect.

Length about 12 mm., breadth about 5.5 mm.

Habitat.—Very abundant on all the coasts of New Zealand, generally found under stones or seaweed about high-water mark, but sometimes extending a little further inland. It runs with great rapidity when disturbed.

Remarks.—It is only after considerable hesitation that I have united *Ligia quadrata*, Thomson, with *Lygia novi-zealandiæ*, Dana. When Mr. Thomson described his species he was acquainted with Dana's description, but found that it differed from his specimens

in some points that appeared very definite and well marked, and he therefore established for them the new species *Ligia quadrata*. All specimens subsequently examined, both by Mr. Thomson and myself, were found to agree with the characters as laid down for *L. quadrata*, and thus to differ from *L. novi-zealandiae*, Dana, and hence in our "Critical List of the Crustacea Malacostraca of New Zealand,"* under the heading *Ligia novi-zealandiae*, the remark is made "I do not know this species. G. M. T." The points in which Dana's description differed from our specimens are:—

- (a) The surface of the thorax and abdomen "covered with very short hairs."
- (b) Base of caudal stylets "nearly as long as the abdomen."
- (c) Branches of caudal stylets "quite unequal" and the longer "hardly as long as the thorax."

In none of the specimens that I have examined could the dorsal surface be said to be "covered with very short hairs," and Mr. Thomson tells me that no hairs are to be found in living specimens, which he has recently re-examined at my request, as I thought it just possible that the hairs might have got worn off in the spirit specimens that I brought from New Zealand with me. I have been anxious to get for comparison specimens from the Bay of Islands, where Dana's type specimens were obtained, and though I have not been successful in this, I have in Mr. Thomson's collection specimens from Waiwera, a locality north of Auckland and not very far remote from the Bay of Islands, and I find that these differ a little from our South Island specimens, and though I regard them as undoubtedly the same species, they show some slight approach towards Dana's description. Thus the antennæ are slightly longer and more slender and distinctly more hairy than in the typical specimens of *Ligia quadrata*, and the surface of the body when viewed with a higher power shows, especially at the edges of the segments, very minute little setæ which, though they scarcely project beyond the surface and are not deserving of the name of "very short hairs," must, I think, have given the appearance which Dana has thus described. In South Island specimens these minute points are much less marked but can occasionally be made out. The uropoda in the Waiwera specimens are a little more slender than in South Island ones, but as in them the base is only about half as long as the abdomen, and I have not seen any in which the base is "nearly as long as the abdomen," but it must be remembered that in young specimens with which Dana perhaps had to deal the uropoda are considerably longer in proportion than in fully-grown specimens. The branches of the uropoda are again usually of nearly the same length, though the outer one is generally a little the shorter, and the variation in their relative lengths is pretty considerable, and specimens in which the difference was more marked than usual may have led Dana to describe them as "quite unequal." The longest branch is, however, always much shorter than the thorax, and I must regard Dana's statement that it is "hardly as long as the *thorax*" as an unintentional exaggeration or else a mistake for "hardly as long as the *abdomen*."

In his "Catalogue of the New Zealand Crustacea," Miers refers specimens in the British Museum to Dana's species without any question beyond remarking that "the rami of the caudal appendages are equal except in one specimen, where they are slightly

* Transactions New Zealand Institute, xviii. p. 157.

unequal." When visiting the British Museum I found, however, that the specimens are labelled "*? Ligia novæ-zealandiæ*, Dana," and that, so far as can be seen in their dried and imperfect condition, they resemble my Waiwera specimens very closely, and thus differ from Dana's descriptions in the other characters that I have pointed out as well as in that of the rami of the uropoda.

I have discussed this question at what will probably be thought to be undue length, but I think that full reasons should always be given before one species is regarded as the synonym of another, and it is well to hesitate before venturing to dispute the accuracy of Dana's descriptions.

As this species is the largest and one of the commonest of the Terrestrial Isopoda of New Zealand, and is, moreover, of a more generalized type than the others, it is deserving of close attention by any who wish to study the group, and I therefore give here a fairly full account of its external anatomy. I do not propose to consider its internal anatomy, though it would no doubt repay careful consideration; indeed, I do not know that the internal anatomy of any species of the genus has yet been worked out in detail, though many years ago Lereboullet published an excellent paper on a species of the closely allied genus *Ligidium**, and Max Weber has more recently given a more minute account of the anatomy of some species of the family *Trichoniscidae* which comes close to the *Ligidæ* †.

Detailed Description of Ligia novæ-zealandiæ. (Pl. 11.)

The size is naturally subject to some variation, but all the specimens that I have seen are considerably smaller than fully-grown specimens of *L. oceanica*. The following measurements may be taken as about the average:—length of body 12 mm.; greatest breadth 6 mm.; length of mesosome 7.5 mm.; of metasome 4 mm.; of antennæ 10 mm.; of uropoda 5 mm. (base 2 mm., rami 3 mm.).

The head is oval, about three times as broad as long, the anterior margin regularly convex and without lateral lobes; the eyes are large and occupy nearly the whole of the lateral margins, their anterior and posterior sides meeting at a distinct angle; the facets are small and very numerous.

The surface of the head shows a transverse depression, interrupted in the middle, just posterior to this angle of the eyes.

The first segment of the mesosome is about as long as the head. Its epimeral portions extend anteriorly about to the middle of the lateral margins of the head, the suture marking them off from the central portion being indistinctly marked in posterior part of the segment only; the posterior margin straight; the second and third segments similar but a little longer than the first; the fourth segment the widest, its posterior margin slightly concave, and lateral angles a little produced backwards; fifth, sixth, and seventh segments gradually narrowing; lateral angles acute and more and more produced backwards, those of the seventh segment reaching nearly to the postero-lateral angles of

* "Mémoire sur la Ligidie de Persoon (*Ligidium Persooni*, Brandt)." Ann. d. Sciences Nat., Seconde Série, tome xx, pp. 103-142, Pl. 4 & 5.

† "Anatomisches über Trichoniseiden," Archiv f. Mikroskop. Anatomie, Bd. xix, pp. 579-648, Tab. xxviii.-xxix.

the third segment of metasome. The sutures dividing the epimera from the central portions are fairly evident in the second, third, and fourth segments, but are indistinct in the fifth, sixth, and seventh; in some specimens they are indistinctly marked in the fifth segment also, and the distinctness of the sutures is, I think, a character that is subject to considerable variation, though Dollfus has established a new genus *Geoligia* differing from *Ligia* only in having the epimera not distinct for a species, *G. Simoni*, found in the forests of Venezuela at an altitude of 1200 metres*.

The metasome is considerably narrower than the mesosome, the first and second segments small and without distinct epimeral projections, third, fourth, and fifth segments subequal with well-developed epimera, lateral angles acutely produced backwards, those of the fifth segment reaching very nearly to the postero-lateral angle of the sixth segment; sixth segment with its posterior margin deeply hollowed on each side for the base of the uropoda, its central part regularly convex.

Surface of whole body slightly granular and with a few irregularities, showing under a high power, especially at the sides, very minute setæ which scarcely project beyond the surface.

The *antennulae* consist of the usual three joints, the first much the broadest, second nearly as long as the first but narrower, the third very small, rounded at the end; a few minute setæ are present, chiefly on the second joint, but no "sensory setæ" were observed.

The *antennae* are represented in Pl. 11, fig. 1 *a.*²: the first three joints are subequal, short, nearly as broad as long, the fourth joint shorter than the fifth but broader; flagellum about as long as the last three joints of the peduncle together; in the fig. *a.*², taken from a specimen 12 mm. in length, the flagellum is composed of fifteen joints, but it may contain a greater or less number, Thomson says "flagellum 16- to 23-jointed." There are numerous short and rather stout setæ on the last three joints of the peduncle, and finer setæ on each joint of the flagellum. In the South Island specimens these latter are usually shorter than the breadth of the joint from which they spring, but in the Waiwera specimens they are fully as long as the joint is wide, or may even slightly exceed this length.

The *mouth-parts* are well developed and of a more generalized type than in most other Terrestrial Isopoda. The *upper lip* calls for no special remark; it is rounded, with a very shallow emargination at its extremity, and provided with numerous short setæ in the usual manner. The *mandibles* are strong and of the same general shape as in *Ligia oceanica*; in the right mandible the outer cutting-edge is formed of four stout teeth; the accessory appendage is slender, bends abruptly about the middle, and on its inner side is prolonged into a slender acutely-pointed process; its terminal part is nearly transparent, and its basal part appears very pale brown and is evidently much less highly chitinized than the corresponding part in the left mandible; between this accessory appendage and the molar tubercle is a soft membranous lobe, rounded at the end and thickly covered with setæ, those along its inner margin being longest and plumose; molar tubercle strong, curving inwards, its truncate extremity covered with closely-set rows of short, stout setæ.

* "Voyage de M. E. Simon au Venezuela," Ann. Société entom. de France, vol. lxii. (1893), p. 343.

The left mandible has the outer cutting-edge of four teeth much as in the right, but the accessory appendage is much stouter, thick and dark brown similar to the outer cutting-edge; it ends in several stout teeth, of which the outer one is the longest and strongest, and is followed by two short double teeth; the membranous lobe and the molar tubercle are similar to those of the right mandible.

The *lower lip* consists of two broad lobes somewhat widely separated, with the extremities broadly rounded and thickly covered with short setæ, most of which are directed inwards.

The *first maxillæ* are practically the same in form as those of *Ligia oceanica*, the outer lobe being stout, longer than the inner, and provided at its extremity with about eight strongly-curved setæ, those to the outer side being the longest and stoutest. The inner lobe is more delicate, apparently membranous; its extremity appears concave on its inner side, and it bears the three characteristic plumed setæ, the distal one being very short and the proximal one the longest.

The *second maxillæ* are stoutly formed, oblong in shape, about two and a half times as long as broad, the extremity irregularly rounded, its inner half and the distal portion of the inner margin fringed with setæ; there is also an oblique row of setæ on the surface of the maxilla near the end; the outer margin bears fine setæ towards the base, the more distal portion being apparently free. I can find no trace of the two plumose setæ which are found in *Ligia oceanica* towards the end of the inner margin, and the division into two lobes, which is partially indicated in *Ligia oceanica* and other species, is not recognizable at all in the present species.

The *maxillipedes* also show rather more coalescence of the different parts than those of *Ligia oceanica*; the first joint (*coxa*) is short and very broad, and the exopodite arising from it is short, subtriangular, rounded at the end, and its free margins fringed with setæ; its articulation with the basos is oblique, extending further distally on the anterior (upper) surface than on the posterior, the extremity of the coxa being strongly convex on the anterior surface but straight on the posterior; the next joint (*basos*) is nearly oblong, fully two-thirds as broad as long, its outer margin slightly convex and bearing a fringe of fine setæ; the inner margin is straight, and is bent inwards (i. e. *upwards*, in the usual position of the mouth-parts) to form a piece at right angles to the outer surface of the maxillipedes; this is thickly covered with short fine setæ, and narrows distally where it extends on to the masticatory lobe, which is formed by a prolongation of the inner part of the basos; the masticatory lobe is truncate distally, and bears there two stout teeth and many finer setæ. The terminal portion of the endopodite ("palp") shows indications of being formed of five segments, of which only the first and last are completely separated from the others, the second, third, and fourth being coalesced into a flat plate with the lines of suture visible towards the inner side only; on the outer side the extremity of each joint is marked by one or two stout setæ, the rounded inner margins of the last four segments are thickly covered with short setæ. Fig. *mxp.** shows the maxillipede from its anterior aspect, i. e. that next to the second maxilla, and from this point of view the connection of the masticatory lobe with the basos can be clearly made out; when seen from the posterior (fig. *mxp.*) the junction of the basos with the

succeeding joint extends right across to the inner margin and makes the masticatory lobe appear separated from the basos though it is directly continuous with it on the anterior surface.

The *first pair of legs* differ considerably in the two sexes. In the female (Pl. 11. fig. 1 *p.*¹ ♀) the appendage is similar to the succeeding pairs, though rather shorter; the basos is somewhat oblong, and bears a few stout setæ on its upper or inner side at the distal end; the lower or outer surface has a slightly hollowed depression, into which the more distal joints of the limb rest when they are bent back upon the basos, as they are in the usual position of the legs. The shape of the other joints and the arrangement of the setæ on them can be readily made out from the figure: the propodos is cylindrical, much narrower than the carpus, and has on its inner margin a regular row of about six short setæ; the dactylus is somewhat slender, and has the basal portion covered, especially on the outer side, with short fine setæ and a few spiniform ones; the terminal portion forms a strong, curved nail with margins regularly curved and without setæ; the accessory nail is about half as long as the terminal one and much more slender; at the base of the terminal nail arises from the outer margin a long, well-marked seta about as long as the terminal nail, but usually curved backwards and having a slight club-like swelling towards its extremity. These points, with regard to the dactylus, are represented in Pl. 11. fig. 1 *p.*⁷ ♀*, which shows the extremity of the seventh pair of legs, but with very slight modification the figure and description apply to all the pairs.

In the male the first pair of legs is much stouter than in the female, the meros is larger and more triangular, while the carpus is ovoid, being much expanded on the inner side, and against it the propodos and dactylus closely impinge and form a powerful subchelate hand; the propodos is stout and slightly curved, and the dactylus rather stouter and shorter than in the female. The general appearance of this appendage in the male is very like that of one of the gnathopoda of an amphipod, or like the first pair of legs in *Phreatoicus*, but in these the subchelate hand is formed by the dactylus impinging against the enlarged and swollen propodos, while in the present species the propodos and dactylus together impinge against the enlarged carpus.

The *second pair of legs* in the *female* is quite similar in form and size to the first. In the *male* it has the form of a subchelate hand like the first pair, but the carpus is much narrower and its inner edge, which forms the palm, is not so convex.

The *third pair of legs* in the *female* is quite similar to the preceding pairs in form, but is usually a trifle longer; in the *male* it may have the carpus very slightly expanded, as in the first and second pairs, but more generally it has nothing of the gnathopod form and is almost identical with the corresponding appendages of the female.

The succeeding pairs of legs in both sexes are gressorial and similar to one another in general form, but there is a gradual increase in length and slenderness as we pass to the seventh pair. In all there is the smooth, slightly concave depression on the basos against which the other joints impinge, and the dactylus always bears the characteristic clubbed seta already described, though in spirit specimens this may sometimes be lost, more frequently so in older and larger forms. The *seventh leg* is represented in Pl. 11. fig. 1 *p.*⁷ ♀, and it is scarcely necessary to give a detailed description of it.

The *pleopoda* present the usual features, and all consist of a short basal portion or protopodite, from which spring the endopodite and exopodite; of these the endopodite is entirely branchial and has its margins perfectly free from setæ, while the exopodite appears to be mainly opercular and usually has its margins more or less fringed with plumose setæ. It will be convenient to describe the pleopoda of the female first, and then to point out the special modifications in the male.

The *first pleopod* has the protopodite short and broad, roughly rectangular but narrowing a little externally; on the outer side it bears a small rounded appendage with margins free from setæ, which appears distinct from the rest of the protopodite though not distinctly separated by any suture or articulation. This appendage, which is found on the first and second pleopoda of both sexes, is perhaps to be looked upon as an "epipodite"; it will, at any rate, be convenient to refer to it by this name. The exopodite is suboval in shape and much larger than the endopodite; its margin bears a few irregular plumose setæ.

The *second pleopod* of the female closely resembles the first, but is slightly larger; from the centre of the sternal plate of the segment is a small subtriangular projection, truncate at the extremity; the epipodite is longer, more pointed at the end, and bears numerous finely-plumose setæ.

The *third, fourth, and fifth pleopoda* are all similar in form, but each a little larger than the preceding one. Pl. 11, fig. 1 *plp.*³ ♂ shows the third pleopod of a male specimen, but will serve almost equally well for that of a female; from the centre of the sternal plate of the segment arises an oval projection, which is produced distally to a fine point; there is no trace of the epipodite, but on the inner side the protopodite is produced into a triangular acutely-pointed process the margins of which bear several plumose setæ; the exopodite is much larger than the endopodite, and is distinctly opercular in structure and has the margins regularly fringed with long plumose hairs; the fourth and fifth pleopods are similar, but as we proceed posteriorly the endopodites, being less covered by succeeding appendages, become more strongly chitinized and more abundantly supplied with stellate pigment cells, the fifth one naturally most so, as it is completely exposed.

In the male the first and second pleopoda are specially modified for the purpose of copulation. In the first pair the pleopod itself is not very different from that of the female, though the exopodite is rather larger and the endopodite is more pointed at the apex, but it is closely associated with the external male organ, which no doubt springs from the last segment of the mesosome but is adherent to the protopodite of the pleopod and in dissection always comes away with it; it forms a long, narrow process, slightly narrowed and curved outwards at the end; this is grooved throughout its whole length on the posterior side, and during life is closely pressed against the anterior side of the long process formed by the endopodite of the second pleopod, and with it forms a tube for the passage of the semen.

In the *second pleopod* of the male the protopodite and the exopodite present little modification, but the whole of the endopodite is specially modified; it forms a 2-jointed penial appendage, strongly chitinized throughout, much more so than the male organ proper already described; the first joint is short, lies transversely, and is moved by

powerful muscles; the second is long, semicylindrical, narrowing and curving outwards at the extremity, which bears numerous fine short setæ with points directed away from the apex; the anterior aspect shows a well-marked groove, from the sides of which near the middle numerous setæ project inwards towards the groove and appear to be for the purpose of holding the male organ against this appendage and keeping it firmly in its place; they probably do so by interlocking with similar setæ on the male organ itself, though these cannot be well made out.

The *uropoda* are of the usual form, the basal portion irregularly cylindrical and somewhat twisted so that when detached it is difficult to get it to lie in its natural position; the outer ramus slightly narrower than the inner, but usually nearly or quite as long; it bears two long setæ at the apex, shorter setæ being usually present on the inner branch; surface of base and rami covered with fine short setæ, giving it a roughened appearance.

Family II. TRICHONISCIDÆ.

This family was established by Sars for *Trichoniscus* and a few other genera that had previously been classed under the Ligiidæ. It is closely related to that family, but may be recognized from it by the fact that the flagellum of the antenna has only a few joints (not more than six or seven); the eggs are small, and contain only a few ocelli (usually three), and the external male organ is single. The animals are usually small and live in damp situations, none of the pleopoda being provided with air-cavities.

Two genera of this family—i. e., *Trichoniscus* and *Haplophthalmus*—are represented in New Zealand.

Genus I. TRICHONISCUS, Brandt. (Pl. 12, figs. 1 & 2, and Pl. 13, fig. 1.)

Trichoniscus, Brandt, Conspectus Crust. Oniscodorum, p. 12 (Bull. Soc. Moscou, vi. p. 174) (1833).

Philougrin, Bate & Westwood, Brit. Sess.-eyed Crust. ii. p. 454 (1868).

Trichoniscus, Budde-Lund, Isopoda Terrestria, p. 243 (1885).

Trichoniscus, Sars, Crustacea of Norway, ii. p. 160 (1898).

Trichoniscus, Stebbing, Proc. Zool. Soc. London, 1900, p. 565 (1900).

Generic Characters.—Body more or less oblong, attenuated behind. Cephalon rounded in front, with small though distinct lateral lobes. Side-plates of the three posterior segments of mesosome more prominent than those of the four preceding segments. Metasome abruptly contracted, with the epimeral plates of the two anterior segments not concealed: last segment narrowly truncate at the tip and slightly emarginate on each side. Eye small but distinct, consisting of only three visual elements imbedded in a dark pigment. Antennulæ with the first joint rather large and curved, last joint generally longer than the second. Antennæ everywhere clothed with small appressed spikes; flagellum much shorter than the peduncle and gradually tapering distally. Oral parts considerably prolonged, giving the buccal mass a pronouncedly conical form. Left mandible with two, right with only a single penicil behind the cutting-part. Maxillipeds with the distal joint of the basal part rather large, and forming at the end outside a broad lamellar expansion finely ciliated at the edge; terminal part lanceolate, with the

outer four joints confluent; masticatory lobe nearly as large as the terminal part, and terminating in a narrow, finely-ciliated lash; epignath oblong-linguiform, with a rounded expansion at the base. Legs of moderate size, slightly increasing in length posteriorly; outer joints extremely spinous. Inner plate of first pair of pleopoda in male greatly produced, biarticulate; that of the second pair of different structure in the different species. Uropoda with the basal part rather broad and flattened, both rami terminating in a pencil of delicate hairs. [Sars, *l. c.* pp. 160-161.]

Key to Species.

1. Dorsal surface and antennæ with distinct though irregular tubercles *T. otakeensis*.
2. Dorsal surface smooth or nearly so.
 - a. Surface with scattered longish setæ. Animal small (4 mm.) *T. phormianus*.
 - b. Surface without scattered setæ. Animal large (7 mm.) *T. Thomsoni*.

1. TRICHONISCUS PHORMIANUS, sp. nov. (Pl. 12, fig. 1.)

Philougria rosea, Chilton, Trans. N. Z. Inst. xv, p. 149 & p. 73 (in part) (1883) [*not* of Koch].

Philougria rosea, Filhol, Mission de l'île Campbell, p. 439 (in part) (1885).

Philygria rosea, Thomson & Chilton, Trans. N. Z. Inst. xviii, p. 157 (in part) (1886).

Specific Description.—Male not differing markedly from the female in the general shape of the body. Body oblong-oval, about two and a half times as long as broad. Dorsal surface not very convex, smooth, or with a few small granulations and irregularities; cephalon and each segment of the mesosome with a few scattered, rather long, stout setæ, which are irregularly arranged and extend more or less over the whole surface, but are most readily seen at the sides, especially in the anterior segments; on the metasome there are few or none; these setæ readily break off in spirit specimens. Cephalon transversely oval, lateral lobes small, front slightly convex. Segments of the mesosome of the usual form, the last three with the posterior angles recurved and acuminate. Metasome about one-quarter the length of the body, rather narrow; first two segments short, epimeral plates of the next three small and appressed; last segment with the terminal expansion rather broad, the posterior margin straight or slightly convex, and bearing three or four small setæ.

Antennæ a little less than one-third the length of the body, rather slender, with long setæ at the extremities of the second, third, and fourth joints and along the inner margin of the fifth; these may arise from slight prominences, but the inner margin of the fifth joint does not bear the distinct tubercles found in the next species; outer margin of the joint straight, with short fine setæ; flagellum as long as the fifth joint, of four joints (sometimes only three), pencil of hairs at extremity long.

Uropoda long, outer branch more than twice as long as the base, conical, narrowing to apex; inner branch nearly as long, but much narrower throughout and tapering very gradually to the apex; both covered with small appressed setæ and with long setæ at apex.

Colour light brown, with irregular marblings of a darker brown.

Size about 4 mm.

Habitat.—Very common all over Canterbury, frequently found on the dead decaying leaves of the New Zealand flax (*Phormium*), and always in damp situations. Also from Dunedin, Kenepuru, Greymouth.

Remarks.—The separation of the New Zealand species of *Trichoniscus* presents considerable difficulty, and it is quite possible that some modification may have to be made in the division I am here adopting, though it is the best I can make with the material now at my command.

The present species was originally confused by me with *T. otakensis*, and both referred to *Philougria rosea*, Koch. Further investigation has shown that I was dealing with two species, and that though each presents considerable resemblances to *Philougria rosea*, Koch, neither can be considered as identical with that species.

The species now under consideration appears to be distinguished from the next species, *T. otakensis*, by the smoother surface of the body, the more slender and smoother antennæ, the presence of stout setæ on the surface, and by the fact that the male and female are approximately of the same general shape.

The stout setæ on the cephalon and mesosome are very characteristic, but they readily fall off in spirit specimens, and confusion may thereby be introduced. Some of my specimens are now so free from all trace of these setæ that I have sometimes been inclined to think that there must be a form destitute of setæ. On the other hand, I have specimens from Kenepuru collected by Mr. MacMahon in which the setæ are still present; they are rather more numerous and shorter than in Canterbury specimens, and the surface is more uneven and tuberculated; it is possible that these specimens will require a separate species to be established for their reception, but in the meantime I prefer to regard them merely as a variety of *T. phormianus*.

The mouth-parts show such a close general resemblance to those of other species of the genus, such as *T. roseus*, that I have not given figures of them. The mandibles and first and second maxillæ present the usual characters; in the maxillipedes the articulation between the coxa and basos is oblique from the external to the internal face like that already described in *Ligia noræ-zealandiæ*: the masticatory lobe into which the basos is prolonged is shorter than the palp, and bears at the end a separate conical portion, thickly covered with fine setæ arranged radially and produced distally into the short terminal lash; in these points this species appears to agree closely with *Trichoniscus Leydigii* as figured and described by Max Weber*.

The seven pairs of legs present no feature of special importance, and I have not observed that any of them are specially modified in the male. The dactylar seta is long and extends fully to the end of the dactylus; at about the middle of its length it divides into two branches, the outer one the thicker, both further subdividing into numerous very fine hairs.

In the female the first pleopod is very like that of *T. pusillus* figured by Sars, but the

* *L. c.* p. 616, pl. xxviii. fig. 18.

endopodite is larger in comparison with the exopodite. In the second pleopod the endopodite is narrow and projects considerably beyond the exopodite. In both pairs there is a lateral expansion of the protopodite corresponding to the "epipodite" described in *Ligia nova-zealandiæ*. The remaining pleopoda are of the usual form.

In the male the first two pairs of pleopoda are specially modified, as in other species, for sexual purposes, but they differ considerably in detail. The first pleopod, together with the sexual appendage, is shown in figure *plp.*¹ ♂. The sexual appendage is soft and membranous, spatulate in form; the endopodite is narrow, subtriangular, and ends in a very long, narrow, chitinous, styliform process which tapers gradually to the very acute apex. In the second pleopod (fig. *plp.*²) the endopodite is modified into a 3-jointed penial appendage, strong and highly chitinised; it is of nearly the same breadth throughout except at the extremity, where it narrows abruptly and ends acutely.

2. *TRICHONISCUS OTAKENSIS*, sp. nov. (Pl. 12, fig. 2.)

Philougria rosea, Chilton, Trans. N. Z. Inst. xv. p. 149, and p. 73 (in part) (1883).

Philypgia rosea, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 157 (in part) (1886).

Philougria rosea, Filhol, Mission de l'île Campbell, p. 439 (in part) (1885).

Specific description.—Male and female differing in the shape of the body.

Female.—Body oblong oval, $2\frac{1}{2}$ times as long as broad; whole dorsal surface thickly covered with irregular, densely crowded, roughish tubercles. Cephalon with the lateral lobes fairly large; margins with two or three setæ, but hardly denticulate; front slightly convex. Segments of mesosome slightly separated laterally; first four segments with the lateral angles rounded, the last three with the postero-lateral angles recurved and acuminate. Metasome rather less than one-fourth the length of the body; last segment with its posterior margin straight and bearing three or four small setæ.

Antennæ rather stout; fourth joint of peduncle stout; fifth joint narrowed at base and expanding slightly distally, its inner margin with four or five distinct prominences, from which short stout setæ may arise; outer margin straight, fringed with fine setæ; flagellum nearly as long as the last joint of peduncle, composed of four joints. Uropoda rather short, stouter than in *T. phormianus*; outer ramus twice as long as the base.

Male.—Much narrower than the female, the greatest breadth less than one-third the length; none of the legs specially modified.

Colour light brown, with markings of darker brown.

Length about 4 mm.

Habitat.—Widely distributed throughout the South Island, N. Z., in damp situations.

Remarks.—This species closely resembles the preceding one in most respects, but can be readily distinguished from it by the tuberculated surface, the stouter antennæ and uropoda, and, in the male, by the narrow form of the body.

The mouth-parts, legs, and pleopoda (including those specially modified in the male) closely resemble those of *T. phormianus* and do not call for special description.

I have a few specimens from Greymouth, collected by Mr. R. Helms, that I refer to this species with some hesitation. The specimens, which appear to be all females, are of slightly larger size, and have the body broader and more compact than in the typical

forms; the tubercles both on the body and on the antennæ are particularly well marked, and, in some specimens at any rate, the flagellum of the antennæ contains five joints.

3. *TRICHONISCUS THOMSONI*, Chilton. (Pl. 13. fig. 1.)

Philygria Thomsoni, Chilton, Trans. N. Z. Inst. xviii. p. 159, pl. v. figs. 1-6 (1886).

Specific description.—Oblong oval, greatest breadth fully half the length, fairly convex, surface quite smooth. Cephalon short, transverse, more than twice as broad as long; lateral lobes small, not visible in dorsal view, front slightly convex, a slight transverse depression a little anterior to the eyes, and an oblique depression starting near the median line between the eyes and extending backwards and outwards. Epimera largely developed, those of the first segment of mesosome produced anteriorly into rounded lobes enclosing fully one-half of the cephalon, those of the second and third segments with the posterior angles rectangular, those of the fourth to seventh segments recurved and acuminate in progressive degree, those of the seventh reaching as far back as the posterior border of the fourth segment of metasome. Metasome much narrower than last segment of mesosome; third, fourth and fifth segments with fairly-developed but closely-appressed epimera; last segment with posterior border straight and bearing three or four small setæ.

Antennæ slender, fourth joint of peduncle nearly as long as the fifth and slightly broader, all covered with fine setæ; one or two longer ones at the extremities of the second, third and fourth joints; flagellum about as long as the last joint of peduncle, of at least five joints; articulations between the more distal joints very indistinct. Legs rather long, increasing considerably in length posteriorly, very spiny. Dactylar seta large and well developed, dividing into two branches, each of which subdivides in many fine hairs. Uropoda rather long, about two-thirds the length of metasome; outer ramus much the stouter, elongate, conical in outline; inner three-fourths the length of the outer, cylindrical, tapering very gradually, both ending in a few setæ.

Colour a light brown, with the greater part of the body covered with markings of a much darker brown, sometimes nearly black; legs with irregular alternate markings of light and dark brown.

Length about 7 mm.

Habitat.—Widely distributed over the whole of the South Island.

Remarks.—This species can usually be recognised by the wide body with greatly developed epimera, by the smooth, almost shining appearance of the dorsal surface, and by the five joints in the flagellum of the antenna. In smaller specimens, however, the epimera are not so much expanded, and the articulation in the flagellum may be very indistinct and identification is the more difficult. Though a true *Trichoniscus* in the mouth-parts, metasome, &c., the general outline is more suggestive of an *Oniscus* or *Porcellis*.

The mouth-parts closely resemble those of the preceding species. The pleopoda also are very similar, except that in the second pleopod the endopodite is more elongate in the female, and in the male the penial appendage formed by it is of a slightly different shape.

Genus 2. HAPLOPHTHALMUS, Schöbl. (1860).

Haplophthalmus, Sars, Crustacea of Norway, ii. p. 166 (1899).

Generic characters.—"Body oblong, moderately convex, sculptured dorsally with more or less distinct longitudinal ribs. Cephalon with the front triangularly produced, though scarcely defined from the epistome; lateral lobes rather large. Side plates of mesosome lamellarly expanded, discontinuous. Metasome not abruptly contracted, epimeral plates of the two anterior segments small, those of the three succeeding ones well developed, laminar; last segment of a similar shape to that in the two preceding genera [*Trichoniscus* and *Trichoniscoides*]. Eyes very small, simple, subdorsal. Antennulae and antennae much as in *Trichoniscus*. Oral parts likewise rather similar, except that the terminal part of the maxillipedes is obscurely 5-articulate, and the epignath simple, lanceolate. Legs short and thick, scarcely at all increasing in length posteriorly. First pair of pleopoda in female very small and rudimentary; those in the male well developed, with the inner ramus strongly produced, biarticulate, terminal joint spiniform; inner ramus of second pair in male likewise produced, triarticulate, last joint narrow, styliform. Uropoda with the inner ramus originating inside a broad expansion of the basal part, and terminating, as in the genus *Trichoniscoides*, in a single slender spine." [Sars, *l. c.* p. 166.]

The genus is represented in New Zealand by the following species only:—

1. HAPLOPHTHALMUS HELMSII, sp. nov. (Plate 12, fig. 3.)

Specific description.—Oblong-oval, about twice as long as broad; strongly convex, the central portion being raised somewhat abruptly above the epimeral portions; epimera well developed and somewhat widely separated. Cephalon with the lateral lobes large; on the dorsal surface between the eyes are two rather large, rounded, roughened tubercles; surface in front of these sloping, rough and uneven; front bluntly triangular. All the segments of the mesosome bear at the outer border of the central portion a raised rounded ridge; posteriorly this becomes more marked, and on the seventh segment the ridges end in two well-marked tubercles projecting backwards a little over the metasome; on the fourth anterior segments of the mesosome there is on each side a smaller and less-marked ridge internal to the one already described and parallel to it. Metasome rather small, not quite one-fourth the length of the body; first *three* segments short and without epimeral expansions, fourth and fifth segments longer and with well-developed epimera; last segment very short, more than twice as broad as long, posterior border straight. Surface of metasome rough like that of the whole body but without distinct ridges or tubercles.

Antennae short, not quite one-fourth the length of the body, rather stout; fourth segment of peduncle a little expanded, shorter than the fifth, which is narrowed at base, all with appressed scales and a few short setae, one or two longer setae on the fifth joint; flagellum as long as the fourth joint of peduncle, of three joints, ending in a pencil of long hairs.

Legs of the usual character, short and rather stout, not visible in dorsal view; dactylar

seen apparently similar to that found in *Falsidacnema*. Uropods very short, base large and broad, rest short; inner one the more slender, arising anteriorly on the outer, but reaching nearly as far posteriorly.

—*Chaetotaxy*—

Lower 4 mm.

Holotype.—Bremen with a single specimen collected by R. Hahn.

Remarks.—I have only the one specimen of this species and am therefore unable to describe the mouth-parts, pleopods, etc. In most respects it agrees well with the generic characters, but differs in having the first three (instead of four) segments of the mesosome small and without lateral expansions.

Family III. TYLIDÆ

This family agrees with the *Ligulidæ* and the *Pseudoscolidæ* in having a well-developed rostral tubercle on the mandibles and three plumose bristles on the inner lobe of the first maxilla. The terminal portion of the maxillipedes is also of fair size, longer than the masticatory lobe. It differs markedly in having the uropods short and entirely concealed beneath the terminal segment. The pleopods, too, are of a special structure, and the spinules of the second to seventh segments of the mesosome are quite distinct from those segments. The body is curved and the animal capable of rolling into a ball. The mesosome consists of six separate segments.

The family contains the single genus *Tylos*, of which numerous species have been described, chiefly from tropical and sub-tropical oceans.

Genus I. *Tylos*. Latreille.

Tylos laticornis Latr. *Annales* 6 p. 141 (1806).

As this is the only genus, it may be considered as having the same characters as the family.

1. *Tylos rufus* Latreille, *sp. nov.* (Page 123 fig. 1.)

Species characteres.—Body oval, very convex, widest thro' the middle, but as broad as long, curved anteriorly posteriorly and with narrow sides which are most evident at the margins. Laterally nearly all the cephalon below the eyes produced forward into a truncated and slightly margined process with raised border above and part of the antennæ arising on a hollow narrow tube and the frontal margin. Anterior margin straight, slightly raised.

First segment of mesosome with two side-plates near, expanding laterally, not marked off from middle portion by transverse margin; closely united to cephalon below the eyes and produced laterally into a slender tube, anterior margin with a shallow sulcus; next three segments with side-plates complete, basal margin angles rounded; side-plates of last three segments similar in shape but deeper, and increasing in size posteriorly; all strongly marked off from first segment. Last segment of mesosome

quadrangular; surface convex and a little uneven, with depressed line parallel to hinder margin; posterior margin slightly convex and fitting evenly into the space between the rather small side-plates of the fifth segment.

Eyes rather large, convex, with about 10 ocelli. Antennulae apparently 1-jointed and immobile. Antennae reaching to posterior border of the first segment of mesosome, last joint of peduncle about twice as long as the fourth and as long as the flagellum; first joint of flagellum strongly geniculate with the peduncle, of the same length as the second, third rather longer, fourth very small, almost rudimentary; the whole antennae covered with numerous short, bluntish setae.

First pair of legs with anterior margin of the basos produced near the distal end into a triangular process, and with a shallow groove posterior to this for the reception of the distal portion of the limb when bent back; second pair with similar but less marked structure; legs scarcely increasing in length posteriorly, all very setose, the setae on the posterior pairs larger and stouter than on the anterior pairs.

Fifth pleopoda with the exopodites strongly chitinised, large, trapezoidal, articulated at the postero-lateral angles, and projecting inwards and forwards so as to meet in the median line and cover a large portion of the anterior pleopoda. Uropoda triangular, outer side convex and with a few setae, inner margin straight, fringed with fine setae, terminal joint small, bearing a few fine setae.

Colour.—Whitish or light yellow, with scattered black spots and usually with opaque white or silvery spots arranged more or less closely in patches; some of the specimens darker, especially along median line.

Length.—About 14 mm.

Habitat.—Lyall's Bay, Wellington (*R. M. Living*), "Wellington, under tussocks near the beach" (*G. M. Thomson*).

Remarks.—I have some hesitation in describing this as a new species, for all the species of the genus appear to be very similar in general appearance and to be distinguished chiefly by differences in the front of the cephalon and the pleopoda, which are somewhat difficult to describe accurately. It is probably not very different from *Tylos spinulosus*, Dana, from Tierra del Fuego, but appears to be less spiny and to differ in the antennae, for Dana describes and draws the flagellum as "3-jointed, the first joint but little shorter than the preceding, and the second as long as the following."

Family IV. SCYPHACIDÆ.

Scyphacinae, Dana (in part), U. S. Explor. Exped., Crust. ii. p. 716 (1853).

Mandibles without molar tubercle, its place being taken by a tuft of long stiff setae or bristles; inner lobe of first maxilla with two plumose bristles; maxillipedes with the terminal joints fairly well developed, lamellar, longer than the masticatory lobe; external male organ single.

The family, for which I propose the definition just given, corresponds in part with Dana's subfamily Scyphacinae, for he rightly observed that in the maxillipedes, *Scyphax* differs considerably from the *Oniscidae*, though his description that they are 2-jointed is.

perhaps, a little misleading. In making it he appears to have counted the basos as one joint and all the terminal part as the second. He did not reckon in the coxa, which is usually more or less distinct, and he included the ischium, which is also usually distinct, with the terminal portion which generally shows indications that it is composed of three or four joints. In cases of this kind the actual number of joints is less important than the comparative sizes of those that are represented, though of course it is not easy to express this in brief language.

I include under this family the genera *Scyphax*, Dana, *Actæcia*, Dana, and *Scyphoniscus*, gen. nov., all of which are represented in New Zealand. It will, I think, also include *Scyphacella*, S. I. Smith, and *Actoniscus*, Hayer, both of which are discussed in another part of this paper, and *Philongria marina*, Chilton, which Stebbing has rightly said cannot remain under *Philongria*, probably also belongs to this family, though as yet I have not had time to examine it sufficiently to say whether it can be referred to any of the genera mentioned or not.

It may be worth while to point out that Kinahan, in his excellent "Analysis of Certain Allied Genera of Terrestrial Isopoda," published in 1857, appears to have recognised the fact that *Scyphax* and *Actæcia* probably formed types of separate families, though owing to the great difference between them in general appearance, he evidently did not think of placing them both in the same family*. The three genera that I have included in this family all agree pretty closely in the mouth-parts and pleopoda, and I am inclined to attach comparatively little importance to the external form of the body.

Genus I. SCYPHAX, Dana.

Scyphax, Dana, U. S. Explor. Exped., Crust. ii. p. 733 (1853).

Scyphax, Miers, Cat. New Zealand Crust. p. 101 (1876).

Scyphax, Budde-Land, Isopoda Terrestria, p. 231 (1885).

Generic description.—Body somewhat convex, not capable of rolling into a ball; epimera moderately developed. Metasome not abruptly contracted, last segment not much produced. Eyes large, of very many ocelli, crescent-shaped, occupying the sides of the cephalon. Antennæ with the flagellum 3- or 4-jointed. Second maxilla with the outer margin a little angularly produced near the base. Mandibles with few penicils behind the cutting part. Legs increasing in length posteriorly. Opercular plates of pleopoda without any air-cavities. Uropoda exposed, inner branch arising only slightly in front of the outer.

Remarks.—I have ventured to give a new diagnosis for this genus which was established many years ago by Dana for the single species *S. ornatus*. In 1876, Miers added a new species, *S. intermedius*, but this, as shown below, proves to be the same as *S. ornatus*.

Another species, *S. setiger*, from New Caledonia, was added in 1885 by Budde-Land, who gave a diagnosis of the genus based mainly on external characters, and considered

* Natural History Review, iv. Proceedings of Societies, pp. 274 & 275 (1857).

it merely a subgenus of *Oniscus*. In 1874 a genus, *Scyphacella*, was established by S. I. Smith*, who says:—"This genus differs from *Scyphax* most notably in the form of the maxillipedes, which in *Scyphax* have the terminal segment broad and serrately lobed, while in our genus it is elongated, tapering, and has entire margins. In *Scyphax* also the posterior pair of legs are much smaller than the others, and weak; the last segment of the abdomen is truncated at the apex, and the articulations between the segments of the terminal portion of the antennæ are much more complete than in our species. The general form and appearance of the genera are the same, and the known species agree remarkably in habits. . . ." Budde-Lund† gives Smith's species, *Scyphacella arenicola*, as nearly related to *Trichoniscus albidus*; and Sars‡, following Budde-Lund, refers to the genus *Scyphacella* as coming under his family Trichoniscidæ. It appears, however, from Smith's remarks that his genus is really nearer to *Scyphax* even than he thought, for of the four points of difference which he gives, two are based on errors in Dana's description, for the seventh pair of legs in *Scyphax* are small and weak only in immature forms and the terminal segment is not truncate, the mistake here having arisen from the fact that the lateral margins of the terminal segment are not shown in his figure. In the other two points of difference *Scyphacella* certainly does approach *Trichoniscus*, but they are, I think, only of comparatively little importance, and the spiny antennæ and whole general appearance of *Scyphacella* are more like *Scyphax* than any *Trichoniscus* that I know of. It is, moreover, evident that *Scyphacella* cannot come under the Trichoniscidæ as defined by Sars, for (1) the metasome is not much narrower than the mesosome, and (2) the eyes, instead of being "small or wholly wanting," are large and prominent. Of course the question could be settled at once if we knew whether the mandible in *Scyphacella* has a molar tubercle or not, and whether the inner lobe of the maxilla has three or two plumose bristles. Unfortunately, no special information is given on these points, either by Smith or by Hayer, who afterwards examined the species. But the mandibles of *Scyphax* are figured by Dana, and presumably these drawings would be noted by Smith, who evidently examined those of *Scyphacella*, for he says "mandibles slender," and if these had possessed a molar tubercle he would almost certainly have noticed it.

Until the question can be settled by the examination of specimens, I think we are justified in including *Scyphacella* under the Scyphacidæ as nearly allied to *Scyphax* if not actually identical therewith.

The genus *Scyphax* is represented in New Zealand only by one species, though another is occasionally classed under it.

1. SCYPHAX ORNATUS, Dana (1853). (Plate 14. fig. 2, and Plate 15. fig. 1.)

Scyphax ornatus, Dana, U. S. Explor. Exped., Crust. ii. p. 734, pl. xlviii. fig. 5 (1853).

Scyphax ornatus, Miers, Cat. N. Z. Crust. p. 101 (1876).

Scyphax intermedius, Miers, Annals & Mag. Nat. Hist. ser. 4, xvii. p. 227 (1876); Cat. N. Z. Crust. p. 102, pl. ii. fig. 8 (1876).

* Rep. U. S. Fisheries, pt. i. p. 567 (1874).

† L. c. p. 249.

‡ L. c. p. 160.

Scyphax ornatus, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1886).

Scyphax ornatus, Budde-Lund, Isopoda Terrestria, p. 233 (1885).

Scyphax intermedius, Budde-Lund, Isopoda Terrestria, p. 233 (1885).

? *Philoscia violacea*, Filhol, Mission de l'île Campbell, Crust. p. 445, pl. liv. fig. 5 (1885).

Scyphax ornatus, Filhol, *l. c.* p. 443 (1885).

Scyphax intermedius, Filhol, *l. c.* p. 441 (1885).

Scyphax intermedius, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1886).

Specific description.—Body elliptical, fairly convex, breadth about half the length, surface finely granular, in smaller specimens sometimes rough with minute setæ. Surface of cephalon flat, depressed. Metasome not abruptly narrower than mesosome, epimere of third to fifth segments of moderate size, last segment triangular, much broader than long, sides concave, extremity bluntly pointed, bearing a few short setæ and with a slight depression on its upper surface.

Eyes very large, crescent-shaped, occupying the whole lateral margins of the cephalon and nearly meeting in front; ocelli very numerous, about 150 to 200, arranged in four longitudinal rows. Antennæ about half the length of the body, spiny in small specimens, in large ones with granulations or small tubercles in addition to the small spines; flagellum as long as the fifth joint of peduncle, which is considerably longer than the fourth, consisting of three joints, the third being followed by a minute terminal joint ending in a tuft of short setæ, first joint longer than the second and slightly shorter than the third. Anterior pairs of legs shorter and stouter than the posterior pairs, which are rather long, the seventh pair not fully developed till animal is nearly adult. Uropoda with the base large, extending a little beyond the extremity of the terminal segment, lateral border with a distinct keel, rami rather narrow, cylindrical, spinose, the inner one very slightly shorter than the outer and not arising much in front of it.

Colour variegated, irregularly spotted with yellowish red, grey, brownish red or black.

Length of largest specimens about 18 mm.

Habitat.—On sandy shores in the North Island and also from Westport. Not found in the south of South Island.

Remarks.—This species was described and figured by Dana in 1853, but does not appear to have been recognised since. Miers described his *Scyphax intermedius* as a separate species in 1876, being misled by Dana's figure of the whole animal where the margins of the terminal segment of the metasome are not marked and the segment consequently appears much more broadly truncate than it really is. I have seen Miers's type specimen in the British Museum and have no doubt that it is only a large specimen of *S. ornatus*, Dana. Although Filhol's description and figures are not altogether satisfactory, I have little doubt that his *Philoscia violacea* also belongs to this species; the large crescentic eyes clearly show that the species cannot be placed under *Philoscia*. In 1885 Budde-Lund described a species, *Scyphax setiger*, from New Caledonia which probably will come near to *S. ornatus*, Dana, though the eyes seem to contain fewer ocelli and the proportions of the joints of the flagellum of the antennæ are different.

Although Dana was undoubtedly dealing with immature specimens when he described

the seventh pair of legs as "much smaller than the others, weak," it is nevertheless true that in this species the development of these legs appears to be delayed longer than is usually the case. In specimens of from 4 to 5 mm. in length, which are running actively on the beach and not otherwise immature, the seventh segment of the mesosome is small and the seventh pair of legs represented either by a small bud or by a weak, non-chitinised appendage, with the joints only faintly indicated and surface free from setæ; in specimens a little larger (6 mm.) the seventh segment is more developed, but still smaller than the sixth, and the legs are of the usual shape but smaller than the sixth and less abundantly supplied with setæ. In specimens of 9 mm. in length I found the seventh segment and appendages fully developed; the male organs were also present, and the specimens apparently fully adult.

Most of the more important points in the appendages of this species have been referred to in the discussion of the genus already given. I give here a few additional notes.

The mandibles are of the type usual in the family. The outer cutting-edge in the right contains three or four stout teeth, brown in colour and highly chitinised; the inner cutting-edge is more transparent, slender, and ends in two large teeth and one or two smaller ones; it is followed by a membranous lappet, the sides and margin of which are densely setose; between this and the dense tuft of stiff plumose bristles is a single large plumose seta. The left mandible is very similar, but the inner cutting-edge is much larger and stouter, and ends in three large teeth which are brown in colour and as strongly chitinised as those of the outer cutting-edge, and there are two plumose setæ between the membranous lappet and the tuft of setæ representing the molar tubercle.

The first maxilla is of the usual form; in the second the external lobe at the end is very small, and the outer margin shows a prominence near the base like that drawn and described by Sars in *Oniscus* and some allied genera.

In the maxillipede the exopodite is about half as long as the basos, oblong with the end rounded; the outer margin of the basos is somewhat expanded, and is fringed with fine setæ towards the distal end; the masticatory lobe is about half as long as the terminal portion of the maxillipede, and has the end obliquely truncate and fringed with setæ; the ischium is short, distinctly separated from adjacent points; on the outer aspect of both the basos and ischium are three or four short setæ near the distal margin; the four terminal joints are coalesced into a single lamelliform plate, with four distinct lobes on inner side representing the different joints of which it is composed.

The legs of the mesosome are spiny, the anterior pairs shorter and stouter than the posterior; the dactylus is long, and has its basal part thickly covered with short setæ, the terminal claw long, narrow and slightly curved, secondary claw very narrow, almost like an ordinary seta. There is no special "dactylar seta."

In the male the first pleopod is remarkable in having the exopodite very large and operculiform; it is articulated as usual to the lateral part of the prolopodite, and extends anteriorly and posteriorly into two large rounded lobes, which show branching thicken-

ings apparently intended to strengthen the large flat plate thus formed; the endopodite consists of a single long slender appendage, gradually narrowing to the end; the epipodite is formed of an oblong lobe with rounded end. The external male organ is short, rather narrow and rounded at the end.

The second pleopod of the male has the exopodite of fair size, subquadrate with angles rounded off, and of similar structure to that of the first pleopod; the endopodite is represented by a 2-jointed appendage, the first joint extending directly inwards like a prolongation of the base, the second at right angles to this, as long as the exopodite, gradually tapering to an acute apex.

The succeeding pleopoda have the exopodite much larger than the endopodite, and apparently mainly opercular; the endopodite is subtriangular, with the inner portion thickened, and is branchial in function.

The uropoda have been already sufficiently described.

2. *SCYPHAX* (?) *AUCKLANDIÆ*, G. M. Thomson. (Plate 15. fig. 2.)

Actæcia aucklandiæ, G. M. Thomson, Trans. N. Z. Inst. xi. p. 249 (1879).

Actæcia aucklandiæ, Budde-Land, Isopoda Terrestria, p. 239 (1885).

Actæcia aucklandiæ, Filhol, Mission de l'île Campbell, p. 443 (1885).

? *Oniscus novæ-zealandiæ*, Filhol, *t. c.* p. 441, Pl. liv. fig. 7 (1885).

Actæcia aucklandiæ, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1886).

Specific description.—Body oblong-oval, length about twice the greatest breadth, sides of mesosome parallel. Cephalon with lateral lobes large and broad; front triangular, depressed, somewhat excavate in the middle (in dorsal vein appearing nearly straight); an oblique ridge on each side running backwards and outwards behind the eyes from near the centre in front to the posterior margin of the cephalon; surface between these ridges roughly tubercular. Side-plates of mesosome well developed, especially those of the first segment; posterior margin of first segment slightly sinuous, posterior angles subacute, posterior angles of succeeding segments becoming more and more acute.

On each segment is a small oblique ridge on the side-plate running backwards and outwards, and between these ridges each segment bears numerous irregular tubercles, some rounded, others more acute; on the three anterior segments they are rather less marked and irregularly arranged; on the four posterior segments they form a regular row of somewhat pointed tubercles projecting a little backward along the posterior margin of the segment, with irregular granulations anterior to this row.

Metasome not abruptly narrower than mesosome, first two segments short, their sides overlapped by the last segment of mesosome; side-plates of third to fifth segments large, produced acutely backwards; surface of each of these segments with a transverse row of small tubercles, and with others irregularly distributed; terminal segment short, much broader than long, triangular, sides concave, extremity rounded and depressed, fitting closely on to the bases of the uropoda.

Eyes of moderate size, situated on a slight prominence above the lateral lobes, and external to the oblique ridges. Antennules easily visible. Antennæ short, reaching backwards to the posterior border of the second segment of mesosome; first three joints short, subequal; fourth longer, somewhat broadened; fifth a little longer than the

fourth, slightly sinuous, narrowed at base; flagellum as long as the fourth joint, stout, composed of four joints, the first two short, subequal, third longer, fourth very short, articulations not very distinct; whole antenna roughly granular, with very few setæ. Legs rather short, not visible in dorsal view, and not increasing in length posteriorly.

Pleopoda apparently as in *Oniscus*, opercular plates with outer margin incurved but not so abruptly notched as in *Oniscus*; no air-cavities. Uropoda with the base large and meeting in the median line, lateral portion expanded, flattened and keeled externally, ending acutely external to the outer ramus; both rami exposed, inner ramus arising a little anteriorly to the outer, but extending backwards to the same point, but with apex rounded and with a very few minute setæ.

Colour brown.

Length 20 mm., breadth 9 mm.

Habitat.—Auckland Island (*Mr. Jennings*).

Remarks.—The above description is taken from a female, the only specimen I have seen. According to Mr. Thomson the male has the whole surface of the body nearly smooth.

I refer Filhol's *Oniscus nova-zealandiæ* to this species with considerable doubt, for his description and figure are hardly sufficient to permit of certain identification. However, some points in his description as to the antennæ and uropoda, and especially that of the tubercles—"les granulations de la rangée postérieure sont plus détachées et leur sommet un peu aigu est dirigé en arrière"—apply exactly to the species in question. He states that his specimens were obtained near Wellington.

I have placed the species under *Scyphax* only provisionally, for I have had only one specimen and have not been able to examine all the mouth-parts, &c. It can hardly come under *Actæcia*, in which it was placed by Mr. Thomson, and though it has considerable resemblance to *Oniscus*, it differs markedly from that genus in the antennæ and uropoda, and also in the maxillipedes, for these, as shown in fig. 2 *map.*, have the terminal part well developed, much longer than the masticatory lobe, and with clear indications of the joints of which it is composed. In this, and in the maxillæ which I have also been able to examine, the species resembles *Scyphax*, and I think it will certainly come under the same family, but it differs greatly from *Scyphax* in the cephalon and in the much smaller eyes. It probably lives on the sea-shore like the rest of the *Scyphacidae*.

Genus 2. SCYPHONISCUS (novum).

Generic Characters.—Body rather narrow, lateral parts not greatly developed. Cephalon with large broad lateral lobes. Metasome abruptly contracted, first two segments rather short, third to fifth with small epimera, last segment short, triangular. Eyes of moderate size, sublateral. Antennule of three joints, the last small, but bearing two or three sensory setæ. Antennæ with the flagellum of three ill-defined joints. Mandibles with a membranous hairy lappet behind the two dentate lamellæ, followed by a long recurved brush-like seta; molar process represented by a dense tuft of recurved setæ of unequal length. Anterior maxillæ with the outer lobe rather weak, some dentate

setæ on its inner margin near the apex, and with a dense row of simple hair-like setæ; inner lobe small, delicate, with two hairy bristles. Second maxillæ distinctly bilobed at the extremity, outer edge not angularly produced near the base. Maxillipedes with the basos rather narrow; masticatory lobe well developed, rounded at end, terminal portion of fair size with the last four joints coalesced into a single triangular plate. Legs short, not increasing much in length posteriorly. Pleopoda simple, opercular plates delicate, and none of them with air-cavities. Uropoda rather produced, base only partially covered by terminal segment, rami not flattened.

Remarks.—In general appearance this genus at first recalls *Trichoniscus*. The most important character by which it is separated from other genera appears to be the structure of the first maxillæ, the outer lobe of which is very peculiar, and quite different from that of any other Terrestrial Isopod that I am acquainted with.* In the mandibles with the dense tuft of stiff setæ apparently representing the molar tubercle and in the maxillipedes this genus seems to resemble somewhat closely *Scyphax ornatus*, and the two species of *Actæcia* described in this paper. The type species, which is the only one at present known, was found on the sea-beach within reach of high tides, and I at first thought that the *Philongria marina* described by me in 1885 † would belong to the same genus, but I find that it has the first maxillæ normal, though, as Stebbing has recently pointed out, the species cannot for other reasons come under *Trichoniscus*‡, and probably will be found to belong to the Scyphacidae.

SCYPHONISCUS WAITATENSIS, sp. nov. (Plate 14. fig. 1.)

Specific description.—Body narrow oval, rather more than twice as long as broad; surface of cephalon and mesosome with small rounded tubercles and other irregularities, generally forming a somewhat irregular transverse row near the hinder edge of each segment. Cephalon with the broad lateral lobes not very clearly defined at their bases, front triangularly produced. Posterior margins of the first four segments of mesosome straight, those of last three with the posterior angles more and more recurved posteriorly. Metasome with the first segment short, second longer, third to fifth with moderate appressed epimera; last segment short, about twice as broad as long, triangular, ending in a slightly rounded angle, sides concave.

Antennæ with the fifth joint of peduncle much longer than the fourth, flagellum as long as the fourth joint, of three joints, the first short, second twice as long, third narrow, about as long as the first, whole antennæ covered with short stout setæ. Legs short, dactyla stout, with the secondary nail small or obsolete; dactylar seta arising near the base of dactylus, longer than dactylus, 2-branched, the outer the stouter and plumose, inner one apparently simple.

Colour brown.

* Dollfus has drawn attention to some abnormalities in the mouth-parts of *Mesarmadillo Alluandi*, Dollfus, the most striking being that the inner lobe of the first maxillæ bears nine hairy bristles, instead of the two usually present in *Armadillidium* (Annales de la Société Entom. de France (1892), lxi, p. 386).

† Proc. Linn. Soc. N.S.W., ix, part 3, p. 463.

‡ Proc. Zool. Soc. London, 1900, p. 565.

Length of largest specimen seen 3.5 mm.

Habitat.—Blueskin Bay, Otago, under seaweed, &c. at high-water mark.

Remarks.—Of this species I have only a few small specimens collected at Blueskin Bay about 1887. I have never found it since, though I have frequently searched the same locality and other similar situations, and I am unable to say whether it attains a larger size or not. In order that its affinities may be made as clear as possible, I have figured the mouth-parts in some detail, and add further description of some of its appendages.

The upper lip is of the usual structure.

The *left mandible* has the outer cutting-edge formed of three well-marked teeth, strongly chitinized, the inner cutting-edge similar and of four teeth; near its base arises a hairy membranaceous lappet with the innermost seta longer than the others; next, at a considerable distance, follows a single long-curved, feathered seta; and next, from a slight prominence, a brush-like tuft of stiff simple setae, the outer ones the shortest, the others gradually increasing in length, the innermost ones being very long.

The *right mandible* is similar, but the outer cutting-edge appears to bear four teeth, and the inner cutting-edge is smaller, less chitinous, and ends in three or four small sharp teeth, apparently arranged in a circle round the extremity.

Lower lip formed of two rounded lobes with numerous setae directed inwards, and between them a narrow tongue-like process with its margins thickly fringed with setae.

The *first maxilla* has the outer lobe oblong in shape, its inner margin fringed in distal half with fine setae, and towards the end bearing about ten dentate setae of various sizes and irregularly arranged; the extremity and a little of the outer margin bears a compact row of long, simple, hair-like setae, the outer ones being the longest, the inner ones stouter and a little incurved. Inner lobe of normal form, the distal plumose bristle much shorter than the other.

The *second maxilla* form a delicate oblong plate, distinctly cleft at the apex, outer lobe about half as large as the inner, both rounded and bearing delicate setae, the inner one with a row of short stouter setae also.

The *maxillipedes* have the epipodite narrow oblong, as long as the basos, truncate at end, end and distal half of outer margin with delicate setae; basos narrow, its outer margin not expanded; masticatory lobe large, more than half the length of the palp; pulp with the ischium distinct, but the remaining joints combined into a triangular plate with its inner margin thickly fringed with setae, and with a faint indication of lobes indicating the separate joints.

The first and seventh legs are shown in the plate, and do not require further description; the dactylar seta is large and well marked; its general appearance will be best learnt from the figure.

The pleopoda appear to be all of about the same structure; in the first the endopodite is of nearly the same size as the exopodite, but narrower; there is a small "epipodite" arising from the basal portion. In the third and succeeding pleopoda the endopodite arises considerably more proximally than the exopodite, and is smaller in proportion. I have not been able to examine the pleopoda in the male. The uropoda have already been sufficiently described.

Genus 3. ACTÆCIA, Dana, 1853.

Actæcia, Dana, U. S. Explor. Exped., Crust. ii. p. 734 (1853).

Actæcia, G. M. Thomson, Trans. N. Z. Inst. xi. p. 249 (1879).

Cylloma, Budde-Lund, Isopoda Terrestria, p. 46 (1885).

Actæcia, G. M. Thomson, Proc. Roy. Soc. Tasmania, 1892, p. 12 (separate copy).

Generic description.—Body convex, capable of rolling into a ball, surface spiny. Metasome not abruptly contracted, terminal segment very short. Flagellum of antennæ 4-jointed. Eyes very large and prominent, on oval elevations along the sides of the head. Maxillipedes with the terminal portion large, lamellar. Legs rather short, not increasing much in length posteriorly. None of the opercular plates of the pleopoda with air-cavities. Uropoda short, not projecting much beyond the outline of the body; base broad and flattened, outer portion produced, outer ramus short, inserted at the end of the base near the inner margin; inner ramus slender.

Remarks.—I propose to retain the genus *Actæcia*, Dana, for the following species, and give for it the above diagnosis. In many respects it appears to resemble *Armadilloniscus*, Ulianin, with which Budde-Lund thought it to be identical, but that genus differs considerably in the form of the head and in possession of air-cavities in the first two pleopoda, and as it presumably belongs to the *Oniscidae*, it probably differs also in the terminal portion of the maxillipedes, but on this point I can get no definite information.

Cylloma, Budde-Lund, agrees so well with the genus in question in the eyes, and terminal uropoda and general shape, that I think it must be the same, though Budde-Lund describes it as having air-cavities in all the opercular plates of the pleopoda; this, however, perhaps arises from the fact that he had only a single badly-preserved (probably dried) specimen, and naturally thought that it belonged to the *Armadillidae* and came near to *Armadillo*.

Hayer's genus *Actoniscus* is, as he points out, nearly related to *Actæcia*, and the difference that he gives in the antennæ is more apparent than real, for *Actæcia* has only four distinct joints in the flagellum, and some of the other differences are of subsidiary importance. On the other hand, the cephalon in his species is more like that of *Armadilloniscus*, but whether it also resembles that genus in the possession of air-cavities in the first two pleopoda or not, I cannot say. In general appearance it certainly appears to resemble *Actæcia* much in the same way as *Scyphacella* resembles *Scyphax*.

The two New Zealand species of *Actæcia* may be distinguished thus:—

Eggs large, crescentic, outer branch of uropoda large, dilated distally *A. euchroa*.
Eyes moderate, outer branch of uropoda minute, acute at apex *A. opitrensis*.

I. ACTÆCIA EUCHROA, Dana. (Plate 15. fig. 3.)

Actæcia euchroa, Dana, U. S. Exploring Exped., Crust. ii. p. 734, Plate 48, fig. 6 (1853).

Actæcia euchroa, Miers, Cat. N. Z. Crust. p. 101 (1876).

Actæcia euchroa, G. M. Thomson, Trans. N. Z. Inst. xi. p. 249 (1879).

Armadilloniscus euchroa, Budde-Lund, Isopoda Terrestria, p. 239 (1885).

Actæcia euchroa, Filhol, Mission de l'île Campbell, p. 443 (1885).

Actæcia euchroa, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1886).

Actæcia euchroa, G. M. Thomson, Proc. Roy. Soc. Tasmania, 1892, p. 12, Plate ii. figs. 1-8 (1892).

Specific characters.—Body convex, surface with short, blunt, scattered spines, especially on the margins of the metasome and on the appendages. Cephalon with the front rounded, with raised frontal margin, a little depressed in middle, a deep groove on each side interior to the prominences bearing the eyes. Inferior margin of first segment of mesosome thickened, not incised. Posterior angles of the first four segments of mesosome subquadrate, those of the last three produced backwards, subacute. Epimeral positions of third to fifth segments of metasome large and contiguous, and containing the outline of the metasome. Terminal segment very short, convex, slightly pointed between the bases of the uropoda. Eyes very large, on two crescentic prominences, occupying whole lateral border of the cephalon; ocelli very numerous, arranged in four or five longitudinal rows. Antennæ with all the joints covered with short blunt spines, flagellum about as long as preceding joint; its terminal fourth joint minute. Uropoda projecting beyond the terminal segment, and pretty accurately filling up the space between the epimera of the fifth segment; outer part of base produced into a rounded lobe, outer branch inserted on the inner portion of the distal margin, spatulate, extending a little beyond the produced portion of the base; inner rami, arising from the under surface of the base, far in front of the outer, slender, scabrous; apex with a long bristle, which is visible in dorsal view.

Colour light grey, with irregular black markings; during life sometimes coloured as in *Scyphax ornatus*.

Length about 10 mm.

Habitat.—Sandy beaches in New Zealand.

Remarks.—This species is frequently found on sandy beaches in company with *Scyphax ornatus*, and is very similar to that species in colour and habits, so that Dana thought it was perhaps the young of *Scyphax*. From what has been already said, it is clear that this is not the case, and that the two are perfectly independent; I have mature males of both species. When pursued, *Actæcia euchroa* rolls itself into a ball, and is then almost indistinguishable from a grain of speckled sand; under similar circumstances *Scyphax ornatus* crouches down closely on the sand, and is then equally difficult to perceive. I have always found these two species on the open sands and never under cover, and the large and well-developed eyes that they both possess have probably been developed in connection with their exposed mode of life.

The extremities have the usual three joints, though the articulations are not always easy to see; the last joint is tapering and bears a few setæ. The mouth-parts show a close general resemblance to those of *Scyphax*, the mandibles and first maxillæ being very similar; the appendage figured by Thomson as the inner lobe of this maxilla is really the second maxilla, which has the outer margin angularly produced near the base, and the outer lobe at the apex very small and indistinct. In the maxillipedes the ischium is distinct, but the following joints are all fused into a triangular plate with lobes on the inner margin indicating the separate joints; the masticatory lobe is small and obliquely truncate, about half as long as the terminal portion of the maxillipede. The legs have the dactyla short and stumpy-looking; the dactylar seta with distal half thickened and presenting a stippled appearance.

The first pleopoda of the male are shown in fig. 3, *plp.*¹ ♂; the male organ is single, broader in basal half, end with small notch; endopodite long, broad at base, apex curving a little outwards, exopodite small and oval. The endopodite of the second pleopod 2-jointed, the second forming a very long, acute process. The other pleopoda present no special features. None of them possess air-cavities so far as I can make out.

2. *ACTÆCIA OPIHENSIS*, sp. nov. (Pl. 15, fig. 4 & Pl. 16, fig. 1.)

Specific description.—Body very convex, rather narrow, more than twice as long as broad. Surface fairly smooth, but with numerous scattered short setæ, especially on the metasome and on the margins of the mesosome. Cephalon with the front broad, straight, with a slightly-raised transverse ridge. Posterior margins of segments of mesosome nearly straight, those of the last two a little produced backwards at the lateral angles; inferior margin of first segment thickened. Metasome convex; side portions of third to fifth segments large and recurved; terminal segment short, much broader than long, its posterior margin regularly convex. Eyes of moderate size, round. Antennæ very setose; second joint of peduncle longer than the third and nearly equal to the fourth, fifth about as long as fourth; flagellum as long as the second joint, of four joints, the first longest, second and third subequal, fourth very small. Legs setose, scarcely increasing in length posteriorly; dactylar seta large and well-marked, simple, its distal two-thirds thickened and apparently resembling a narrow circular brush. Uropoda with basal joint very large, extending beyond terminal joint, expanded and plate-like laterally; outer margin subrenate and bearing four or five stout setæ; outer branch small, conical, scarcely projecting, tipped with a few small setæ and one or two longer ones; inner branch reaching a little beyond end of terminal segment, scabrous, and ending in two long setæ.

Colour yellowish, with numerous black stellate markings, some specimens nearly black.

Size.—Length about 6 mm.

Habitat.—Timaru, under seaweed at high-water mark.

Remarks.—I have placed this species under *Actæcia* with considerable hesitation, for it differs from the preceding species very markedly in the structure of the eyes. In external appearance it is rather like *Tylos*, but the mouth-parts are of course very different and are in fairly close general agreement with those of *Actæcia euchroa*. The terminal portion of the maxillipede is less lobed, and the masticatory lobe has a small terminal lash very like that in some species of *Trichoniscus*.

The pleopoda in the female are of usual form and apparently all similar; in each the exopodite is slightly larger than the endopodite and overlaps about half the succeeding one. In the male the first pleopoda are rather short and very strong, the endopodites in close apposition and apparently coalesced along the median line, the ends curving outwards; the second pleopod with basal portion of endopodite long, end joint not very acute.

Family V. ONISCIDÆ.

In this family the molar tubercle of the mandible is replaced by a tuft of stiff setæ, the inner lobe of the first maxilla bears only two plumose bristles; the terminal portion of the maxillipedes is short, scarcely longer than the masticatory lobe. The uropoda are more or less exposed, and the inner ramus arises anteriorly to the outer.

The family contains numerous genera, of which four are represented in New Zealand.

Genus 1. ONISCUS, Linné (1767).

Oniscus, Linnaeus, Syst. Nat. ii. p. 1061 (1767).

Oniscus, Bute & Westwood, Brit. Sess.-eyed Crust. ii. p. 166 (1868).

Oniscus, Budde-Lund, Isopoda Terrestria, p. 202 (1885).

Oniscus, Sars, Crustacea of Norway, ii. p. 170 (1899).

Generic description.—"Body broad and depressed, with the lateral parts of the segments lamellarly expanded. Cephalon with well-defined lateral lobes, front imperfectly defined from the epistome. Metasome not abruptly contracted, last segment considerably produced. Eyes large, sublateral. Antennule with the terminal joint well developed. Antennæ slender and elongated, with the flagellum composed of three articulations. Mandibles with numerous penicils behind the cutting-part. Legs moderately slender, gradually increasing posteriorly. Opercular plates of pleopoda without any air-cavities, those of the two anterior pairs deeply bilobed. Uropoda rather produced, with the inner ramus originating far in front of the outer." (Sars.)

Although there are no actual air-cavities in the opercular plates of the first and second pleopoda in *Oniscus*, Stoller* has recently shown that in the outer portion of these plates there is a structure which performs the same function of allowing the animal to breathe ordinary dry air.

1. ONISCUS PUNCTATUS, G. M. Thomson (1879). (Pl. 16. fig. 2.)

Oniscus punctatus, G. M. Thomson, Trans. N. Z. Inst. xi. p. 232, pl. x a. fig. 3 (1879).

Oniscus punctatus, Budde-Lund, Isopoda Terrestria, p. 206 (1885).

Oniscus punctatus, Filhol, Mission de Pile Campbell, p. 440 (1885).

Oniscus punctatus, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1886).

Specific description.—Body oblong-oval, rather more than twice as long as broad, rather convex, whole surface covered with short setæ which in dried specimens give the appearance of small scale-like markings. Cephalon with the front depressed, produced slightly into an obtuse lobe; lateral lobes small, ending subacutely. Mesosome with the posterior margins of the first three segments straight and their posterior angles rectangular; lateral angles of last four segments produced more and more backwards, acute. Epimera of third to fifth segments of metasome well developed, narrow, ending acutely; terminal segment not much produced, triangular, much broader than long, the rounded apex reaching as far as the end of the base of the uropoda and bearing a few minute setæ which scarcely project beyond its margin.

* Zoologica. Heft xxv. (1899)

Eyes of moderate size, with fifteen to twenty ocelli. Antennæ as long as the head and first three segments of mesosome minutely setose throughout; second and third joint subequal, fourth longer, fifth twice as long as the fourth and longer than the flagellum; joints of flagellum increasing in length distally, and the third followed by a styliiform process or bristle, fully as long as the first joint and dividing at the end into a compact pencil of setæ. Legs fairly long and very spinous, increasing considerably in length posteriorly. First two pairs of pleopoda with the opercular plates partially bilobed. Uropoda with the outer joint much longer and stouter than the inner, which arises only a little anterior to it and reaches to the middle of the outer, both setose and bearing one or two longer setæ at the end.

Colour brown, with wavy stripes of white on each side the median line and often with two lateral rows of whitish patches, the number and size of the white markings varying greatly.

Length about 10 mm.

Habitat.—Very common throughout the whole of New Zealand.

Remarks.—I have had some little hesitation in referring it to the genus *Oniscus* as now restricted, for it differs distinctly from the definitions of that genus as given both by Budde-Lund and by Sars in that the mandibles do not bear so many "penicils" behind the cutting-part; I find only *one* on each mandible, though another one or sometimes two are situated on the setose membranaceous lappet just internal to the cutting-edge. According to Budde-Lund *Oniscus* should have four or five penicils. Moreover, the anterior segments of the mesosome have the posterior margin straight instead of deeply sinuate, and the last segment is broader and less produced than is usual in *Oniscus*. Budde-Lund (p. 206) suggests that the species under consideration may belong to *Philoscia*, and it certainly agrees with that genus in the mandibles and in the posterior margins of the segments of the mesosome, but it differs from that genus in possessing well-marked though small lateral lobes on the cephalon, and in having the epimera of the mesosome of fair size, and those of the third to fifth segments of metasome well marked. On the whole I prefer to leave the species under *Oniscus*, for though allied genera are plentiful enough I cannot at present find one that will suit it better.

The species is widely distributed throughout New Zealand, and presents considerable variation in colour, breadth, and compactness of the body prominence of the front and lateral lobes, &c. I have some specimens collected by Mr. W. W. Smith on limestone rocks at Albury, Canterbury, which in colour resemble the variety *marmoratus* of *Porcellio scaber*, the general surface being very light yellow, marked with somewhat sparsely-scattered black dots and markings; the small spines on the surface are more marked than in typical specimens, the front is less produced, and the lateral lobes of the cephalon are very small and inconspicuous, while the joints of the flagellum of the antennæ are more equal in length. In other respects they resemble *Oniscus punctatus* so closely that I prefer, for the present at any rate, to consider them merely as a variety of that species, for which I propose the name *marmoratus*.

The specimens from Mount Wellington, Tasmania, referred to this species by

Mr. Thomson *, differ in having the side-plates of the third to fifth segments of the metasome much smaller, and thus approach still more closely to *Philoscia*, under which they should perhaps be placed.

2. *ONISCUS KENEPURENSIS*, sp. nov. (Pl. 16. fig. 3.)

Specific description.—Body regularly oblong-oval, broad, the length rather less than twice the greatest breadth; dorsal face but slightly convex, finely granular, not setose, each segment bearing on each side of the median line a slightly raised and wrinkled patch, most marked on anterior segments. Cephalon small, deeply sunk into first segment of pereion, frontal edge regularly convex; lateral lobes very small, subacute at apex. Side-plates of mesosome greatly prominent, lamellar, contiguous, projecting almost laterally, those of the first segment extending forwards into subacute lobes, which reach to the level of the anterior margin of the eyes; posterior angle broadly rounded; posterior margins of the second and third segments slightly sinuous; posterior angles rectangular, slightly rounded. Posterior angles of the fourth to seventh segments progressively produced more and more backward and ending acutely; those of the seventh reach as far posteriorly as the end of the epimeral portion of the third segment of metasome. First two segments of metasome of fair length, but wholly embraced by the preceding segment; epimeral plates of the next three segments produced and recurved, ending acutely, the last reaching slightly beyond the end of the terminal segment. Terminal segment triangular, broader than long, sides slightly concave, end rounded and reaching as far as the end of the base of the uropods, posterior portion slightly depressed and concave.

Eyes of moderate size, about fifteen ocelli. Antennæ very similar to those of *Oniscus punctatus*, scabrous, the minute setæ being less prominent than in that species. Legs long, spinose, the posterior pairs somewhat elongated. Opercular plates of pleopoda not bilobed. Uropoda with basal joint large; outer ramus broad at base, tapering regularly and equally on both sides to an acute point, scarcely setose, inner ramus reaching to the middle of the outer, minutely setose.

Colour.—Slate-coloured, with white markings on the wrinkled patches on the mesosome and usually with a lateral row of white patches at junction of epimera with the central portion.

Length about 11 mm., breadth 6.5 mm.

Habitat.—Kenepuru (*J. McMahon*).

Remarks.—In fully-grown specimens this species can be readily distinguished from *Oniscus punctatus* by the flattened body, the greatly-developed epimera, and the wrinklings on the dorsal surface; in younger forms all of these points are less marked, but the species can then be usually recognized by the large and acutely-pointed outer rami of the uropods.

* Proc. Roy. Soc. Tasmania, 1892, p. 10 (separate copy).

3. *ONISCUS COOKII*, Filhol.

Oniscus Cookii, Filhol, Mission de l'île Campbell, 1885, p. 142, pl. 54, fig. 6.

The following is the description given of this species by Filhol:—

“ J'ai recueilli cette espèce sous les pierres sur la portion ouest de l'île du milieu de la Nouvelle-Zélande. Elle ne mesure que 0^m·008 de longueur et 0^m·004 de largeur. Le corps est ovalaire et remarquablement bombé; la tête est large, les antennes externes sont très fines et leur cinquième article plus développé à la longueur du flagellum. Il n'existe pas de poils ni sur les articles basilaires des antennes externes, ni sur le flagellum. La base des articles composant les antennes est brune, alors que le sommet est blanc. Les anneaux du thorax sont assez développés d'avant en arrière. Ils sont couverts, en grande partie, de très fines granulations d'une teinte noire. Les granulations font défaut en différents points des anneaux et, là où elles manquent, on observe des surfaces un peu creusées, d'une teinte noisette. Ces surfaces dénuées de granulations, et apparaissant en creux à cause des saillies que font les granulations qui les limitent, sont de formes très variables. Tantôt elles sont arrondies, tantôt elles se divisent et figurent de grossières arborisations. Sur les anneaux de l'abdomen on retrouve ces plaques, mais elles sont alors granuleuses, comme le reste des anneaux qui les présentent. Les stylets externes sont les plus développés et leur bord externe est garni, ainsi que celui des stylets internes, de soies très-fines, courtes et très serrées.”

I cannot recognize this species unless, indeed, it be *Oniscus kenepurensis*.

Genus 2. *PHILOSOCIA*, Latreille (1804).

Philoscia, Latreille, Hist. des Crust. &c. t. 7, p. 43 (1804).

Philoscia, Bute & Westwood, Brit. Sess.-eyed Crust. ii. p. 448 (1868).

Philoscia, Budde-Lund, Isopoda Terrestria, p. 207 (1885).

Philoscia, Sars, Crustacea of Norway, ii. p. 172 (1899).

Generic Characters.—Body oval, slightly convex, with rather thin integuments. Cephalon rounded in front, without any projecting lateral lobes. Side-plates of mesosome but slightly prominent. Metasome abruptly contracted, with the epimeral plates small and appressed; last segment not much produced. Eyes well developed, lateral. Antennae very slender, with the flagellum composed of three articulations. Mandibles with only a single penicil behind the cutting-part. Legs very slender and greatly increasing in length posteriorly. Opercular plates of pleopoda without any air-cavities and scarcely bilobed. Uropoda not much produced, with the inner ramus not attached so far in front as usual. [Sars, *l. c.* p. 173.]

1. *PHILOSOCIA PUBESCENS*, Dana. (Pl. 16, fig. 1.)

Oniscus pubescens, Dana, U. S. Explor. Exped., Crust. ii. p. 730, pl. 48, fig. 2 (1853).

Oniscus pubescens, Miers, Cat. N. Z. Crust. p. 99 (1876).

Philoscia minna, Budde-Lund, Isopoda Terrestria, p. 219 (1885).

Philoscia pubescens, Budde-Lund, Isopoda Terrestria, p. 223 (1885).

Oniscus pubescens, Filhol, Mission de l'île Campbell, p. 140 (1885).

Oniscus pubescens, Thomson & Chilton, Trans. New Zealand Inst. xviii. p. 158 (1886).

Philoscia minna, Dollfus, Bull. Soc. Zool. de France, xviii. p. 188 (1893).

Specific description.—Body narrow oblong-oval, surface smooth and shining in large specimens, in small specimens bearing numerous short setæ. First and second segments of mesosome with posterior margins straight, lateral angles rounded, posterior margin of third slightly sinuate, posterior angles of last three segments only slightly produced backward, subacute. Metasome abruptly narrower than mesosome; epimera of third to fifth segments small, closely appressed. Terminal segment triangular, flat, sides straight or a little incurved, apex subacute.

Antennæ very long and slender, from one-half to two-thirds the length of the body, very hirsute, especially towards the end and in small specimens; third and fourth joints together equal in length to the fifth, which is as long as the flagellum, the three joints of which are subequal; terminal stylet slender, about two-thirds the length of the last joint. Legs long, greatly increasing in length posteriorly, very spinous. Opercular plates of the second and succeeding pleopoda with three or four setæ projecting at right angles to the surface. Basal joint of uropoda reaching well beyond the last segment; inner surface scabrous and with a few setæ; outer side with a well-marked groove, becoming shallower towards the base; inner branch rather more than half as long as the outer, arising only a little in front of it, with numerous short setæ and two longer ones at the apex; outer ramus much stouter and conical, scabrous, and with some small setæ but fewer than on the inner ramus.

Colour light brown, often whitish, with various markings of darker brown, arranged roughly in a median and two lateral longitudinal bands, frequently with a row of whitish patches at the bases of the epimera. Legs yellowish white with brown markings, especially on the basal joints.

Length about 10 mm., breadth 4 mm.

Habitat.—Under rotten wood in forests, Whykare River (*Dana*); Howick, Auckland (*G. M. Thomson*); Takapuna (*L. Hames*); Kenepuru, Marlborough (*J. McMahon*).

Remarks.—I have little doubt that the specimens which I have described above are to be considered as belonging to *Oniscus pubescens*, Dana. From his description and figures it is evident, as Budde-Lund has already inferred, that he was dealing with a species of *Philoscia*. His figure shows an Isopod less narrow than most of my specimens, but it was taken from a specimen only 3 mm. long, and I have specimens of about the same size that correspond very closely to his figure, and from the series at my command I am able to record the fact that in young specimens the metasome may be only as long as it is broad at the base, while in larger specimens it may be fully twice as long as broad, and that the mesosome shows corresponding variations; in large forms, too, the antennæ become longer and more slender. Dana's specimens were obtained from the north of Auckland, and most of my specimens are also from places not very far removed where the species appears to be fairly common, and I know of no other species from that neighbourhood to which Dana's description could apply.

I have little doubt that the species described by Budde-Lund from the Cape of Good Hope under the name *Philoscia mina*, and afterwards recorded by Dollfus from three localities in the Seychelles, is the same as the New Zealand species. Budde-Lund's description applies well to my specimens, and the groove on the outer surface of the base of the

uropoda appears very characteristic. Dollfus's figure is very like that of my larger specimens, though the closely-appressed epimera of the metasome are not shown, and in accordance with what I have said the metasome is shown narrower than it is in young specimens. Dollfus calls attention to the fact that while Budde-Lund described the surface as glabrous, his specimens "présentent au contraire des poils épars, qui paraissent, il est vrai, assez caducs." I am able to explain the inconsistency, for my specimens show that while the smaller specimens (even sexually mature) usually possess numerous scattered setæ, the largest specimens have the surface nearly or quite glabrous.

I give figures of the first and second pleopoda of the male, which are of much the usual type and do not call for special description. Attached to the male organ in connection with the first pleopod is the vas deferens and apparently a large portion of the testes, which came away with it when I dissected off the pleopod.

2. *PHILOSCIA NOVÆ-ZEALANDIÆ*, Filhol.

Philoscia novæ-zealandiæ, Filhol, Mission de l'île Campbell, 1885, p. 144, pl. 54, fig. 2.

Filhol gives the following description of this species:—

"Cette espèce, que je crois nouvelle, a le corps allongé, ovalaire, assez bombé dans la portion médiane. Les antennes externes sont couvertes sur leurs bords antérieur et postérieur et sur leur face externe de poils courts, très fins, très serrés et ayant dans leur forme, leur disposition quelque chose qui rappelle de petites épines. Les segments du thorax sont granuleux sur presque toute leur étendue et les granulations sont d'un brun noirâtre. Là où elles font défaut la carapace est d'une teinte jaune clair. Les parties granuleuses sont disposées de telle manière qu'elles constituent tout le long du corps de l'animal trois sortes de bandes noirâtres; l'une médiane, les deux autres latérales. Les stylets caudaux externes sont un peu plus longs que les stylets caudaux internes, mais ils sont tous couverts de poils très fins sur toute leur surface. Il existe une ligne de ponctuations noires le long du bord externe des stylets externes.

	m.	m.
Longueur	0.022	à 0.026.
Largeur	0.008	à 0.009.

J'ai trouvé cette espèce aux environs de Wellington dans l'île du Nord, aux environs de Dunedin dans la province d'Otago et enfin dans l'île Stewart."

I cannot identify this with any species known to me; the figure shows the side-plates of the metasome much larger than is usual in *Philoscia*, but does not help in deciding what the species Filhol had before him.

Genus 3. *PORCELLIO*, Latr., 1804.

Porcellio, Spence Bate & Westwood, British Sessile-eyed Crustacea, ii. p. 173 (1868).

Porcellio, Budde-Lund, Isopoda Terrestria, p. 82 (1885).

Porcellio, Stebbing, History of the Crustacea, p. 126 (1893).

Porcellio, G. O. Sars, Crustacea of Norway, ii. p. 176 (1899).

The following are the generic characters as given by Sars:—

“Body oval, more or less depressed, with the lateral parts lamellarly expanded. Cephalon partly flanked by the side-plates of the first segment of mesosome, lateral lobes well developed, frontal lobe more or less projecting, and distinctly defined from the epistome. Metasome not abruptly contracted, epimeral plates of the third to fifth segments prominent and recurved; last segment conically produced. Eyes, as a rule, well developed, subdorsal. Antennæ moderately slender, with the flagellum composed of two articulations only. Oral parts normal. Legs gradually increasing in length posteriorly, last pair in male sometimes slightly differing from that in female. Opercular plates of the two anterior pairs of pleopoda, and sometimes of the three succeeding pairs, provided with distinct air-cavities. Copulative organs of male of a similar structure to that in *Ouisca*. Uropoda distinctly projecting, outer ramus lanceolate, inner much smaller, linear, and originating far in front of the former.”

PORCELLIO SCABER, Latr.

Porcellio scaber, Latreille, Hist. Nat. des Crustacés et des Insectes, vol. vii. p. 45.

Porcellio scaber, Spence Bate & Westwood, British Sessile-eyed Crustacea, ii. p. 475 (1868).

Porcellio graniger, White, List. Crust. Brit. Mus. p. 99 (1847), *sine descr.*

Porcellio graniger, Miers, Ann. Mag. Nat. Hist. (ser. 4) xvii. p. 226 (1876), and Cat. New Zealand Crustacea, p. 99 (1876).

Porcellio graniger, Budde-Lund, Isopoda Terrestria, p. 129 (1885).

Porcellio graniger, Budde-Lund, *l. c.* p. 149 (1885).

Porcellio graniger, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1886).

Porcellio graniger, Haswell, Cat. Australian Crust. p. 280.

Porcellio graniger, G. M. Thomson, Proc. Royal Soc. Tasmania, 1892, p. 4.

Porcellio scaber, Stebbing, History of the Crustacea, p. 127 (1893).

Porcellio scaber, G. O. Sars, Crustacea of Norway, ii. p. 176 (1899).

Specific Characters.—“Body oblong-oval, about twice as long as it is broad, dorsal face slightly convex and very rough, owing to the presence of numerous rounded tubercles. Cephalon with the lateral lobes rather large and rounded, frontal lobe less prominent, obtusely triangular. Side-plates of mesosome of moderate size, with the posterior corners acutely produced. Metasome occupying about one-quarter of the length of the body; epimeral plates of the third to fifth segments strongly recurved; last segment rather produced, terminating in an acute point slightly grooved dorsally. Antennæ less slender, scarcely attaining half the length of the body; flagellum about as long as the last peduncular joint, and having its two articulations of nearly equal size. Last pair of legs differing but little in the two sexes. Opercular plates of only the two anterior pairs of pleopoda with air-cavities. Uropoda with the outer ramus broadly lanceolate, and comparatively larger in male than in female. Colour of dorsal face generally of a uniformly greyish black; sometimes, however, lighter, and variegated with irregular dark patches, more rarely black, with the side plates light yellowish. Length of adult female 14 mm.” (Sars.)

Habitat.—Found in great abundance throughout the whole of New Zealand, especially around buildings, in greenhouses, &c.; rarely in the native bush.

Remarks.—This species is practically cosmopolitan, being found all over Europe, North America, at the Cape of Good Hope, and Kamtschatka. In Australia it has been recorded from Melbourne and Tasmania, and I have specimens from Sydney also. In New Zealand it has hitherto been known under the name *Porcellio graniger*, Miers, though Mr. G. M. Thomson suggested some years ago that it was probably a cosmopolitan species, and pointed out how easily it might be spread by artificial means*. Budde-Lund, in his "Isopoda Terrestria," had previously suggested that the New Zealand species was perhaps the same as *P. lavis*, Latr., but a comparison of specimens has shown that it differs considerably from that cosmopolitan species, but is undoubtedly the same as *P. scaber*, Latr.

The variety *marmorata*, in which the general dorsal surface is lightly coloured and variegated with irregular dark patches, is pretty abundant in New Zealand, and the variety *marginata* "black, with side-plates light yellowish," is also sometimes seen. Some years ago Mr. W. W. Smith sent me a large series of specimens from Ashburton, some of the usual form (variety *immaculata*), others of the variety *marmorata*, and a large number with the whole dorsal surface (in spirit) of a reddish-brown varying from a light yellowish-brown to dark orange-brown, some of them having the side-plates lighter in colour than the centre portion; there is a similar specimen in Mr. Thomson's collection, and I have occasionally seen similar specimens from other localities; in this form the tubercles on the dorsal surface are hardly so well marked as in some of the darker forms belonging to the variety *immaculata*, but there seems to be considerable variation in the degree of tuberculation in all the varieties.

Many years ago Brandt described albino and partially albino forms of this species, and gave figures showing all the stages between complete albinos and the ordinary dark-coloured forms†.

The great variability in colour of this species has been noted by Filhol in specimens collected from New Zealand.

Genus 4. METOPONORTHUS, Budde-Lund, 1879.

Metoponorthus, Budde-Lund, *Isopoda Terrestria*, p. 161 (1885).

Metoponorthus, Sars, *Crustacea of Norway*, ii. p. 183 (1899).

Generic Characters.—"Body oblong, subdepressed, with very thin integuments. Cephalon with the lateral lobes very small, frontal lobe obsolete. Side-plates of mesosome but very slightly prominent. Metasome abruptly contracted, with the epimeral plates of third to fifth segments sub-appressed; last segment comparatively short, triangular. Eyes well developed, lateral. Antennule very small, with the last joint quite short. Antennæ slender and elongated, flagellum biarticulate. Oral parts nearly exactly as in *Porcellio*. Legs slender, and greatly increasing in length posteriorly.

* "Proc. Royal Society Tasmania," 1892, p. 4 (separate copy).

† *Horæ Soc. entom. Ross. T.* viii. (1871), pp. 167-176, 1872.

Opercular plates of the two anterior pairs of pleopoda with air-cavities, more rarely also those of third or of all pairs. Copulative organs of male nearly as in *Porcellio*. Uropoda rather produced, and of a similar structure to that in *Porcellio*."

1. ? *METOPONORTHUS PRUINOSUS*, Brandt.

Porcellio pruinosus, Brandt, Consp. monogr. Crust. Isop. terrestr. p. 19, fig. 21.

Porcellio zealandicus, White, List. Crust. Brit. Mus. p. 99, 1817 (*sine descrip.*) ; Miers, Cat. N. Z. Crust. p. 100 (1876).

Metoponorthus pruinosus, Budde-Lund, Isopoda Terrestria, p. 169 (1885).

Porcellio neo-zealandicus, Thomas & Chilton, Trans. N. Z. Inst. xviii, p. 158 (1886).

Metoponorthus pruinosus, Sars, Crustacea of Norway, ii, p. 181 (1899).

Budde-Lund gives *Porcellio zealandicus*, White, as a doubtful synonym of *Metoponorthus pruinosus*, Brandt. I have seen the type specimen in the British Museum; it is dried and not very well preserved, but is undoubtedly a *Metoponorthus*, and apparently very closely resembles *M. pruinosus*. It would certainly not be extraordinary if this cosmopolitan species were found in New Zealand, but I have never met with it, though White's specimen, if really from New Zealand, must have been collected there before 1817, and we might naturally have expected that the species would have become abundant since then.

To make the account of this species complete, I quote here the description given of it by Miers:—

"Elongate oblong, finely granulous, the granules seriate on the posterior margin of each segment. Head small, transversely oblong, with the latero-anterior angles not prominent. Segments of the thorax (the last excepted) with the posterior and infero-lateral margins straight, the infero-posterior angles obtuse; last segment of thorax broad, with the posterior margin concave, the infero-lateral margin straight, the infero-posterior angle acute. Segments of the abdomen considerably narrower than those of the thorax, short; terminal segment equilaterally triangular, slightly concave above, sides straight. Caudal appendages with the base shorter than the terminal segment, the longer (exserted) ramus narrow, acute, projecting beyond the terminal segment to a distance equal to its own length. External antennæ very long and hairy—length nearly one-third inch. New Zealand (Coll. Brit. Mus.)."

Family VI. ARMADILLIDÆ.

In this family the body is generally convex, and the animals capable of rolling up into a ball; the metasome is not abruptly narrower than the mesosome. There are air-cavities in two or more of the outer branches of the pleopoda, and the uropoda are usually short and not produced beyond the terminal segment. In other respects the family resembles the *Oniscidæ*, with which it is so connected by some intermediate genera that, as Sars has pointed out, it is rather difficult to get points of difference that will apply in all cases.

The family contains many genera, several of which have been established during

recent years by M. Adrien Dollfus, but all the New Zealand species appear to be referable to *Armadillidium* and *Armadillo*.

GENUS 1. ARMADILLIDIUM, Brandt, 1830.

Armadillidium, Budde-Lund, Isopoda Terrestria, p. 49 (1885).

Armadillidium, Dollfus, Feuille des Jeunes Naturalistes, iii^e Série, 1^{er} Mai 1892, No. 259 (1892).

Armadillidium, Sars, Crustacea of Norway, ii. p. 188 (1899).

Generic Characters.—"Body oblong or elliptical in form, very convex, and capable of being rolled up into a perfect ball. Cephalon with the front distinctly marginate, lateral lobes rounded and sharply defined at the base. Epistome vertical, forming above a triangular shield, advancing more or less beyond the frontal edge. Side-plates of first segment of mesosome large, securiform, not incised behind. Metasome semi-circular, with the edges continuous throughout; last segment lamellar, quadrangular or triangular in form, not extending beyond the limits of the epimeral plates of the penultimate segment. Eyes distinct, lateral. Antennule with the terminal joint but little produced. Antennæ, as a rule, not attaining half the length of the body, penultimate peduncular joint scarcely longer than the second; flagellum biarticulate. Opercular plates of only the first two pairs of pleopoda with air-cavities. Uropoda very short, with the basal part broad, lamellar, outer ramus spatulate, inner narrow, cylindric." (Sars.)

1. ARMADILLIDIUM VULGARE, Latr.

Armadillo vulgaris, Latreille, Hist. Crust. vol. vii. p. 48.

Armadillo vulgaris, Bate & Westwood, Brit. Sess.-eyed Crust. ii. p. 492 (1868).

Armadillidium vulgare, Budde-Lund, Isopoda Terrestria, p. 66 (1885).

Armadillidium vulgare, Dollfus, Feuille des Jeunes Naturalistes, iii^e Série, No. 259 (1^{er} Mai 1892).

Armadillidium vulgare, Sars, Crustacea of Norway, ii. p. 189 (1899).

Specific Characters.—"Body oblong-oval, more than twice as long as it is broad, side-contours sub-parallel, dorsal face strongly vaulted and perfectly smooth. Cephalon, seen dorsally, broadly quadrangular, transversely truncated in front, lateral lobes comparatively small, rounded. Side-plates of first segment of mesosome with the posterior corner acute. Metasome broad, semicircular, scarcely occupying more than one-fifth of the length of the body; last segment much shorter than it is broad at the base, and slightly tapering distally, tip transversely truncated. Antennæ very short, scarcely exceeding in length one-quarter of the body; flagellum about the length of the last peduncular joint, and having its first articulation somewhat shorter than the second. Last pair of legs with the ischial joint rather large, equalling in length the succeeding part of the leg. Copulative appendages of the first pair of pleopoda in male with the tips slightly divergent; opercular plate of the second pair rather produced, but scarcely curving outwards at the tip. Uropoda with the outer ramus much shorter than the basal part, and very broad, its distal edge being continuous with the last segment. Colour of distal face somewhat variable, sometimes uniformly dark grey or nearly black, sometimes variegated with lighter patches, generally arranged on the mesosome in three longitudinal rows, one median and two lateral; between them, moreover, on each

segment is a group of more or less distinct flexuous stripes. Length attaining 14 mm." (Sars.)

Habitat.—Nelson (J. C. Gully), and Mount Egmont (S. H. Drew).

Remarks.—I have a few specimens from Nelson and one from Mount Egmont that undoubtedly belong to this species, which is very widely distributed throughout all Europe, and the adjacent parts of Asia and Africa. According to Budde-Lund it has also been widely dispersed, probably by artificial means, and has been found at New York, Monte Video, Melbourne, &c. It has not been previously recorded from New Zealand, and it is a little strange that it should have been taken at Nelson and Mount Egmont, when it has not yet been found at any of the chief ports or in other parts of the Islands.

My specimens agree very closely with the figures and descriptions given by Sars and Dollfus, and I have been able to compare them with specimens from England, and can find no points of difference between them. In the male the first pair of legs has the carpus a little more swollen than is shewn in Sars' figure, and has the propodos bent back upon it so as to form an imperfectly subchelate hand. I find, however, that the degree to which this structure is developed varies in different individuals, and it is perhaps fully developed only in the adult male, or perhaps only during the breeding season. The long ischium of the seventh pair of legs is also a characteristic of the fully-grown male; in the females it is only of normal length; in the male, too, the meros and carpus of the first six pairs of legs, and especially of the fourth, fifth and sixth, are much more setose than in the female.

With regard to the colour, Budde-Lund distinguishes two varieties: first, *immaculata*, "e plumbeo griseus," and second, *variegata*, "annulorum marginibus albis serieque dorsali triplici vel quadruplici macularum flavarum." Dollfus, who has given a detailed account of this species in the work quoted, says: "Les ♂ sont généralement d'un gris uniforme, ou avec quelques taches safranées; les ♀ d'un brun plus ou moins clair, avec des taches et marbrures pâles." The few specimens that I have from New Zealand are all males, and are of a uniform dark slaty-grey colour.

Genus 2. ARMADILLO.

Armadillo, Budde-Lund, Isopoda Terrestria, p. 35 (1885).

Generic Characters.—Resembling *Armadillidium* in most respects, but with the shield on the epistome much less marked, and the grooves for the antennæ consequently very shallow; the side-plates of the first segment of the mesosome usually, and those of the second segment sometimes, incised or grooved; the last segment of metasome subtetragonal, broader at the base than apex, sides concave; the outer branches of all the pleopoda with air-cavities: uropoda with the base large, flattened and produced so as to fill up the space between the side-plates of the fifth segment and the terminal segment; outer branch small, inserted on inner margin of the enlarged base; inner branch arising more anteriorly, quite concealed in dorsal view by the terminal segment.

This genus contains many species, a large proportion of which are found, as Budde-

Lund says, on the islands and shores of the Pacific. In New Zealand there are at least six species which may be distinguished as follows:---

A. Surface of body nearly smooth.

I. Inferior margin of first segment of mesosome simple.

a. Outer branch of uropoda very small, rudimentary *A. speciosus.*

b. Outer branch of uropoda of moderate size *A. ambitiosus.*

II. Inferior margin of first segment of mesosome grooved along its whole length *A. Danae.*

III. Margin of first segment of mesosome notched behind *A. rugulosus.*

B. Surface of body with crests or tubercles.

I. Surface with numerous thin crests or flange-like processes *A. Hamiltoni.*

II. Surface with setose tubercles.

a. Tubercles large, about four on each segment of mesosome *A. Macmahoni.*

b. Tubercles small, acute, numerous *A. spinosus.*

1. ARMADILLO AMBITIOSUS, Budde-Lund. (Plate 16, fig. 5.)

Armadillo ambitiosus, Budde-Lund, Prospectus Crust. Isop. terr. p. 7 (1879); Isopoda Terrestria, p. 34 (1885).

Specific description.—Body oval, very convex, nearly smooth, minutely punctate. Dorsal surface of cephalon marked off from the pre-epistome by a well-marked ridge, which at the sides projects a little above the surface of the cephalon, centre usually a little depressed; dorsal surface smooth or a little uneven, pro-epistome smooth, flat. Inferior margin of first segment of mesosome thin, with a small tooth posteriorly on the inner surface; second segment with the inferior margin entire, thicker in front, the thickened part ending abruptly in a small tubercle on the inner surface at some little distance from the margin. Posterior margins of the anterior four segments sinuate, posterior angle of first produced backwards subacute, that of second a little produced. Terminal segment of metasome a little longer than its breadth at base, narrowing abruptly, the posterior portion with sides parallel or slightly divergent; posterior margin truncate, slightly rounded or squarely truncate, often with a very small emargination in the centre.

Antennæ minutely setose, flagellum as long as fourth joint of peduncle, and shorter than the fifth, its second joint three times as long as the first, apex with styliform appendage about as long as first joint. Eyes somewhat large, with about 20 ocelli. Basal joint of uropoda with the portion exposed dorsally narrow, about twice as long as broad, end sharply rounded; exterior ramus slender, arising from well-marked notch on inner margin of base, not reaching quite to the end of base; inner branch a little shorter than the terminal segment. Colour usually brownish, varying considerably in depth of tint, usually with wavy markings of a lighter colour on each side of median line.

Length up to 15 mm., breadth about 7 mm., height 3.5 mm.

Habitat.—Widely distributed in North Island; also found at Greymouth and Kenepuru.

Remarks.—This is a widely-spread species, and appears to show considerable variation. It is quite possible that I am including under it forms that others might look upon as separate species, but my difficulty has been that if I divide it up at all, I

would require to establish at least four or five new species for its members, and I shrink from such an undertaking.

In specimens that I look upon as typical forms the whole surface of the head and body is smooth, the ridge along the front of the cephalon is not very prominent, especially in the centre, the end of the last segment is nearly straight (corners rounded) and with indication of a slight emargination in the centre, and the "tooth" on the inner side of the lateral margin of the first segment, and the small tubercle on that of the second, are fairly distinct. I have some specimens from Greymouth, where the ridge along anterior border of head is much more pronounced, the "tooth" and "tubercle" less evident, end of last segment slightly rounded with no indication of emargination; the surface of the head, moreover, presents some slight irregularities, and there are a few indistinct wavy elevations on the sides of the median line of the body; the central part of the last segment is a little raised, though hardly sufficient to be called ridged, and the basal portion of the last segment, and the epimeral portions of the third to fifth segments of the metasome, are rather broader than in the type.

Two specimens from Wanganui in Mr. Thomson's collection agree with these Greymouth specimens in the ridge on the anterior margin of cephalon, and in the "tooth and tubercle," but the epimeral portions of metasome and the basal portion of the uropoda are fully as narrow as in the typical specimens; the end of last segment is quite squarely truncate, and the whole body is nearly smooth. In these two specimens the inner branch of the uropoda is shorter than in any other I have seen.

Specimens from other localities show other combinations of these various characters, and on the whole I think it wisest to consider them all as belonging to one species.

2. ARMADILLO DANÆ, Heller.

Spherillo danæ, Heller, Reise der Novara, p. 134, pl. xii. fig. 4 (1865).

Armadillo inconspicuus, Miers, Ann. & Mag. Nat. Hist. ser. 4, xvii. p. 225 (1876); Cat. N. Z. Crust. p. 95, pl. ii. fig. 4 (1876).

Spherillo danæ et *Armadillo inconspicuus*, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 159 (1886).

Armadillo danæ, Budde-Lund, Isopoda Terrestria, p. 39 (1885).

Armadillo inconspicuus, Budde-Lund, *l. c.* p. 39 (1885).

Armadillo inconspicuus, Filhol, Mission de l'île Campbell, p. 439 (1885).

Spherillo danæ, Filhol, *l. c.* p. 440 (1885).

Specific description.—In the cephalon surface and general appearance closely resembling *A. ambitiosus*. Posterior border of first segment of metasome only very slightly produced backwards, that of others straight. Lateral margin of first segment with a narrow groove extending along its whole length, becoming shallower anteriorly, second segment also with lateral margin deeply grooved. Segments of metasome short, epimeral portions less elongated than in *A. ambitiosus*, terminal segment a little broader at base than at the extremity, end truncate, slightly rounded.

Basal portion of uropoda with exposed portion small, end rounded, outer ramus minute, inner ramus reaching very nearly to the end of last segment.

Colour brownish, with lighter wavy markings on each side the median line.

Length about 10 mm.

Habitat.—Takapuna, Auckland (L. Hames); Auckland (Heller), Bay of Islands (Dana). Filhol says that he has found this species in great abundance in the North Island, and that it becomes less and less abundant towards the south, though he gathered a few examples of it on Stewart Island. The statement as to the greater abundance in the north is also true of *Armadillo inconspicuus*, which this species closely resembles, and there is nothing to show definitely that Filhol distinguished the one from the other.

I have a single specimen of this species before me from Takapuna, Auckland, and have no difficulty whatever in identifying it with *A. inconspicuus*, Miers. It also agrees very well with Heller's description, if we remember that the part he speaks of as the outer branch of the uropoda is the outer distal portion of the base, and that his "inner branch" is really the outer, though, as usual in this genus, arising from the inner margin of the produced portion of the base.

In colour and general appearance this species is very like *A. ambitiosus*, Budde-Lund, but it may be readily distinguished from that species by the groove on the lower margin of the first segment of the mesosome, and by the minute outer branch of the uropoda.

3. ARMADILLO SPECIOSUS, Dana. (Pl. 16. fig. 6.)

Armadillo speciosus, Dana, U. S. Explor. Exped., Crust. ii. p. 718, pl. 47. fig. 2 (1853).

Armadillo speciosus, Miers, Cat. N. Z. Crust. p. 95 (1876).

Armadillo speciosus, Budde-Lund, Isopoda Terrestria, p. 39 (1885).

Armadillo speciosus, Filhol, Mission de P'ile Campbell, p. 439 (1885).

Specific description.—Body very convex. Cephalon with frontal margin raised, a little interrupted in the centre. Segments of mesosome each with transverse row of indistinct tubercles or granules; inferior margin of first segment simple, curving a little outwards. Segments of metasome in close contact, the last nearly as broad at apex as at the base; sides concave, posterior margin straight. Uropoda with the outer joint minute, rudimentary, inner branch slender, extending to the end of last segment.

Colour light reddish brown, with darker markings.

Length about 6 mm.

Habitat.—Bay of Islands (*Dana*); Chatham Islands (*Hutton*).

Remarks.—I have three or four specimens (mostly imperfect) from Chatham Islands that I have little hesitation in assigning to Dana's species. He describes his genus *Armadillo* as having the external ramus of the uropods obsolete, and figures his species *A. speciosus* in accordance with this view. It is true that in the specimens before me the outer branch is present, but it is so minute that it would be impossible to show it in a figure the same size as that which Dana gives of the whole animal, and it would be difficult to see it with the magnifying power likely to be used for making such a drawing, while in the view of the uropoda from beneath, which is the one shown in Dana's enlarged figure, it is quite concealed. In other respects it agrees so well with Dana's description and figure that I identify it without much hesitation with his species.

It can be readily distinguished from *A. danæ*, Heller, which it otherwise greatly resembles, by the absence of a groove on the inferior margin of the first segment of the

mesosome. The specimens from Nelson, Wellington, &c., previously identified with this species by Mr. Thomson and myself *, do not belong to this species, but to *Armadillo ambiciosus*, Budde-Lund.

4. *ARMADILLO RUGULOSUS*, Miers, 1876. (Pl. 16. fig. 7.)

Cubaris rugulosus, Miers, Ann. & Mag. Nat. Hist. ser. 1. xvii. p. 225 (1876); Cat. N. Z. Crust. p. 96, pl. ii. fig. 5 (1876).

Cubaris rugulosus, Chilton, Trans. N. Z. Inst. xv. p. 73 (1882).

Armadillo rugulosus, Budde-Lund, Isopoda Terrestria, p. 10 (1885).

Cubaris rugulosus, Filliol, Mission de Pile Campbell, p. 440 (1885).

Cubaris rugulosus, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 158 (1888).

Specific description.—Body moderately convex, surface of segments uneven, faintly rugose. Head broad and transverse, front margin revolute, first segment of mesosome with two shallow depressions diverging anteriorly on the anterior part of the upper surface; posterior margin sinuous, angles produced backwards; lower posterior margin with a notch for reception of succeeding segment, the notch not extending along the inferior margin; second segment similarly notched. Dorsal surface of segments of mesosome often with a slight groove parallel to posterior margin; the second, third, and fourth narrowed at sides with inferior margins rounded; fifth, sixth, and seventh broader, with inferior margins truncate. Metasome with terminal segment broadest at base, sides at first suddenly converging, then parallel or slightly divergent, extremity square truncate. Antennae finely hirsute, flagellum shorter than fifth joint of peduncle, second joint three times as long as the first. Uropoda with outer branch small, not quite reaching to the end of last segment; inner branch short, reaching half way from its base to end of last segment.

Colour light brown, with variegated markings of a rich reddish brown, some specimens very dark.

Length about 6 mm.

Habitat.—Very abundant in South Island.

Remarks.—This species is much smaller than either of the two preceding, and may generally be readily distinguished from them by the different character of the notches in the posterior lateral margins of the first and second segments of mesosome. I have, however, some specimens from Kenepuru in which these notches are less marked, and the inner branch of the uropoda is a little longer than usual, and the colour is rather greyish. The specimens are not very well preserved, and I prefer for the meantime to consider them merely as a variety of the species under consideration.

The oblique depressions on the first segment of the metasome described by Miers are generally present, but are more distinct in some specimens than in others; they are also present in some specimens of *Armadillo ambiciosus*, Budde-Lund, and are probably more or less the necessary consequence of the head fitting in to the first segment when the animal is rolled up, and are therefore probably of little classificatory value. In some specimens the irregularities on the dorsal surface are more distinct than in others, and

* Trans. N. Z. Inst. xviii. p. 159.

they may even give the appearance of a poorly-marked transverse row of small tubercles on the segments of the metasome; it is perhaps specimens of this kind that Heller described under the name *Spherillo monolinus*, but as he says nothing about the notches on the inferior margins of the first two segments of the metasome, I do not feel justified in definitely identifying our species with his.

5. ARMADILLO MONOLINUS, Dana, 1853.

Spherillo monolinus, Dana, U. S. Explor. Exped., Crust. ii. p. 719, pl. 47, fig. 3 (1853).

Spherillo monolinus, Heller, Voy. Novara, Crust. p. 135 (1865).

Armadillo Aucklandicus, Budde-Lund, Isopoda Terrestria, p. 40 (1885).

I have seen no specimens that I could refer to this species. Dana describes it as follows:—

“Head arcuate in front. Segments of thorax transversely marked with a beaded ridge and laterally truncate, anterior segment longest and marked with two beaded ridges. Abdomen semicircular, third, fourth, and fifth segments laterally obtuse, the last with a nearly subquadrate apex, and much broader at base. Caudal appendages subtriangular, shorter than breadth at base, inner margin broadly excavate. Antennæ nearly naked, flagellum hardly shorter than preceding joint. Length 4 lines.”

Dana's specimens were obtained at “Wykare River, near Bay of Islands.”

Heller describes a specimen from Auckland, and at the end of his description says: “I denote this species as *S. monolinus*,” without making it clear whether he is referring it to Dana's species or giving it as a new species, using by inadvertence the same name. Budde-Lund supposes Heller's species to be new, and therefore changes the name to *Aucklandicus*. I think, however, that it is more likely that Heller intended to refer his specimen to Dana's species, and there is nothing in his description inconsistent with this supposition; Miers had evidently taken this to be Heller's intention, but curiously enough he does not give the reference to Heller's description, though he quotes it for the habitat when describing *Spherillo monolinus*, Dana. It is possible that this species may be the same as *A. rugulosus*, Miers.

6. ARMADILLO HAMILTONI, sp. nov.

“Remarkably sculptured Terrestrial Isopod.”—G. M. Thompson, Annals & Mag. N. H. ser. 6, xii. p. 225, pl. iv.

Specific description.—Oblong-oval, breadth rather more than half the length, epimeral portions greatly developed and projecting downwards and outwards, central part greatly raised above the epimera and richly supplied with spines and crests. Cephalon with the dorsal surface produced forwards into a thin plate projecting far over the bases of the antennæ; from the dorsal surface of the cephalon arise two transverse lateral crests or flanges, which project horizontally forwards as far as the central prolongation of the vertex; the posterior margin of the cephalon is curved upwards, and a little exterior to the median line is produced upwards into a conical tooth; the posterior margins of each segment of the mesosome is similarly produced upwards and somewhat backwards into two teeth, those on the seventh segment being very large and prominent; the first

segment has two pairs, and each of the other six segments one pair, of conical teeth or spines arising at right angles to the dorsal surface and situated in the same longitudinal lines as the teeth already described. More laterally each of the first six segments bears on each side two thin crests arranged in two longitudinal lines, but the crests of each segment widely separated from those of the contiguous segments; in the seventh segment the outer pair of crests is represented only by small spines. External to the outer row of crests each segment bears two or three small tubercles or spines, which are concealed in dorsal view by the outer row of crests. Epimera very largely developed and projecting somewhat horizontally, that of the first segment much larger than any of the others; first two segments of metasome concealed in dorsal view by the projecting hinder margin of the last segment of the mesosome; each of the third to fifth segments has the hinder margin produced into two teeth similar to those in the mesosome but smaller; these teeth increase in size from the third to fifth segment. From the centre of the terminal segment arises a small keel projecting backwards, and ending in a sharp tooth; the epimera of the third to fifth segments are very long and narrow; hinder margin of terminal segment straight, not much narrower than the base; sides concave.

Eyes of moderate size, convex, of about twenty facets. Antennule and antennæ not observed. Uropoda with the lateral portion of the joint long and narrow, end rounded, outer branch narrow, fully three times as long as broad, arising from a well-marked notch in the inner margin of the base, not reaching to the end of the terminal segment, ending in a small seta; inner branch very short, scarcely reaching as far as the base of the outer branch.

Colour a rich brown, with numerous markings of a darker brown.

Length 6 mm.

Habitat.—Petane, near Napier (*A. Hamilton*).

Remarks.—In accordance with a wish expressed by Mr. G. M. Thomson, I gladly name this species after its discoverer, Mr. A. Hamilton. I have only the dried specimen originally described and figured, but not named, by Mr. Thomson, but it is, I think, sufficient to show that the species may, provisionally at any rate, be placed under *Armadillo*. The wealth of crests and spines or teeth on the dorsal surface is quite extraordinary, and I fear that the description will convey a very inadequate idea of the actual specimen; a better idea may be got by consulting Mr. Thomson's figures. Mr. Thomson describes the legs as "very feebly developed and, as far as I could make out, appear to want the dactylos." There are no legs now attached to the specimen, but in the tube I found two fragments possessing normal dactyla similar to those found in other species of *Armadillo*.

7. ARMADILLO MACMAHONI, sp. nov. (Pl. 16. fig. 8.)

Specific description.—Body convex, tuberculated and setose, especially on the tubercles; surface with depressed hexagonal markings. Cephalon with the dorsal surface roughened, somewhat setose, front with well-marked transverse ridge, a little lower in the middle. First segment of mesosome with inferior margin revolute anteriorly, posterior portion deeply notched, second segment also notched, but with the inner lip of the notch not

reaching downwards so far as lower margin. The mesosome bears four longitudinal rows of tubercles (*i. e.*, from tubercles on each segment), the two inner rows a little external to the median line, the other two more lateral; on the anterior segments the tubercles are not very prominent, but on the succeeding segments they become larger and more prominent and project slightly backwards; on the seventh segment the two median tubercles are very large and project backwards over the metasome, while the lateral tubercles are poorly marked and form only slight elevations at the outer side of the base of the others. The tubercles are covered especially near the apex with numerous stiff setæ. Shorter setæ are also found on the rest of the surface, and some of them, especially along the posterior margins of the segments, are broad and scale-like. Metasome with an indistinct median ridge formed by a setose tubercle on each of the last four segments, that on the fifth the largest; first and second segments short, the first almost concealed by the preceding segment, all the segments of mesosome fitting closely together; terminal segment much broader than long, sides concave, posterior margin slightly convex.

Eyes rather small, of about ten ocelli. Antennæ short.

Uropoda with base fitting closely into the space between the side-plates of the fifth segment and the terminal segment; outer branch very minute, not projecting beyond the inner margin of the base, inner branch reaching about to end of last segment.

Colour brown.

Length about 6 mm.

Habitat.—Kenepuru, Marlborough, in the bush (*MacMahon*).

Remarks.—I take pleasure in naming this fine species after Mr. Joseph MacMahon, to whom I am indebted for many Terrestrial Isopoda collected at Kenepuru.

S. ARMADILLO SPINOSUS, Dana, 1853.

Spherillo spinosus, Dana, U. S. Explor. Exped., Crust. ii. p. 723, pl. 47, fig. 6 (1853).

Spherillo spinosus, Miers, Cat. N. Z. Crust. p. 97 (1876).

Armadillo spinosus, Budde-Lund, Isopoda Terrestria, p. (1885).

Spherillo spinosus, Thomson & Chilton, Trans. N. Z. Inst. xviii. p. 159 (1885).

The following is Dana's description of this species:—

“Body bristled throughout with subacute spines, margin either side a little produced and segments laterally truncate. Head nearly trapezial, arcuate in front, and a little broader than behind. First segment of thorax largest; segments of abdomen laterally obtuse, the last subquadrate, not broader at base, truncate at apex.

“New Zealand, near Bay of Islands (Coll. Dr. C. Pickering; *Dana*). Under bark of pine-trees.”

Remarks.—I have seen no specimens of this species, but it appears to come near *A. MacMahoni*, differing, however, in having the spines much more numerous and more acute.

EXPLANATION OF THE PLATES.

Reference Letters.

- a^1 = antennula.
 a^2 = antenna.
 c = cephalon.
 $l.s.$ = labrum superior.
 $l.i.$ = labrum inferior.
 $M.dee.$ = right mandible.
 $M.sin.$ = left mandible.
 $m.r^1$ & $m.v^2$ = 1st and 2nd maxilla.
 $map.$ = maxillipede (outer, *i. e.*, posterior or under aspect).
 map^* = maxillipede (inner, *i. e.*, anterior or upper aspect).
 pru = pereon (or mesosome).
 $p^{1,2 \dots 7}$ = 1st, 2nd, 3rd 7th leg.
 p^1 , &c. = extremity of 1st leg, &c.
 pl = pleon (or metasome).
 $plp^{1,2}$, &c. = 1st, 2nd pleopod (anterior aspect).
 $plp^{1,an.}$, &c. = 1st pleopod, &c. (posterior aspect).
 urp = uropod.

[Where necessary, the sex is indicated by the sign ♂ or ♀ placed after the letters as above.]

PLATE XI.

Fig. 1. *Ligia nova-zealandie*, Dana. Dorsal view of whole animal and details.

PLATE XII.

- Fig. 1. *Trichoniscus phormianus*, sp. nov. Dorsal view and details.
 2. *Trichoniscus otakensis*, sp. nov. Dorsal and side views of female, dorsal view of male, and enlarged view of head and antennæ of female.
 3. *Hyplophthalmus Helmsii*, sp. nov. Dorsal view and details.

PLATE XIII.

- Fig. 1. *Trichoniscus Thomsoni*, Chilton. Dorsal view and details.
 2. *Tylos neozelandicus*, sp. nov. Side view and details.

PLATE XIV.

- Fig. 1. *Scyphoniscus waitateensis*, nov. gen. et sp. Dorsal view and details.
 2. *Scyphax ornatus*, Dana. Dorsal view and details.

PLATE XV.

- Fig. 1. *Scyphax ornatus*, Dana (continued). Details.
2. *Scyphax* (?) *aucklandiae*, G. M. Thomson. Dorsal view and details.
3. *Actæcia euchroa*, Dana. Dorsal view and details.
4. *Actæcia ophiensis*, sp. nov. Dorsal view of pleon and details.

PLATE XVI.

- Fig. 1. *Actæcia ophiensis*, sp. nov. (continued). Details.
2. *Oniscus punctatus*, G. M. Thomson. Details.
3. *Oniscus kenepurensis*, sp. nov. Dorsal view and details.
4. *Philoscia pubescens*, Dana. Details.
5. *Armadillo ambitiosus*, Budde-Lund. Antenna and terminal portion of pleon.
6. *Armadillo speciosus*, Dana. Terminal portion of pleon.
7. *Armadillo rugulosus*, Miers. View from below of lower margins of 1st and 2nd segments of pereion.
8. *Armadillo Macmahoni*, sp. nov. Dorsal and side views and dorsal view of pleon and details.